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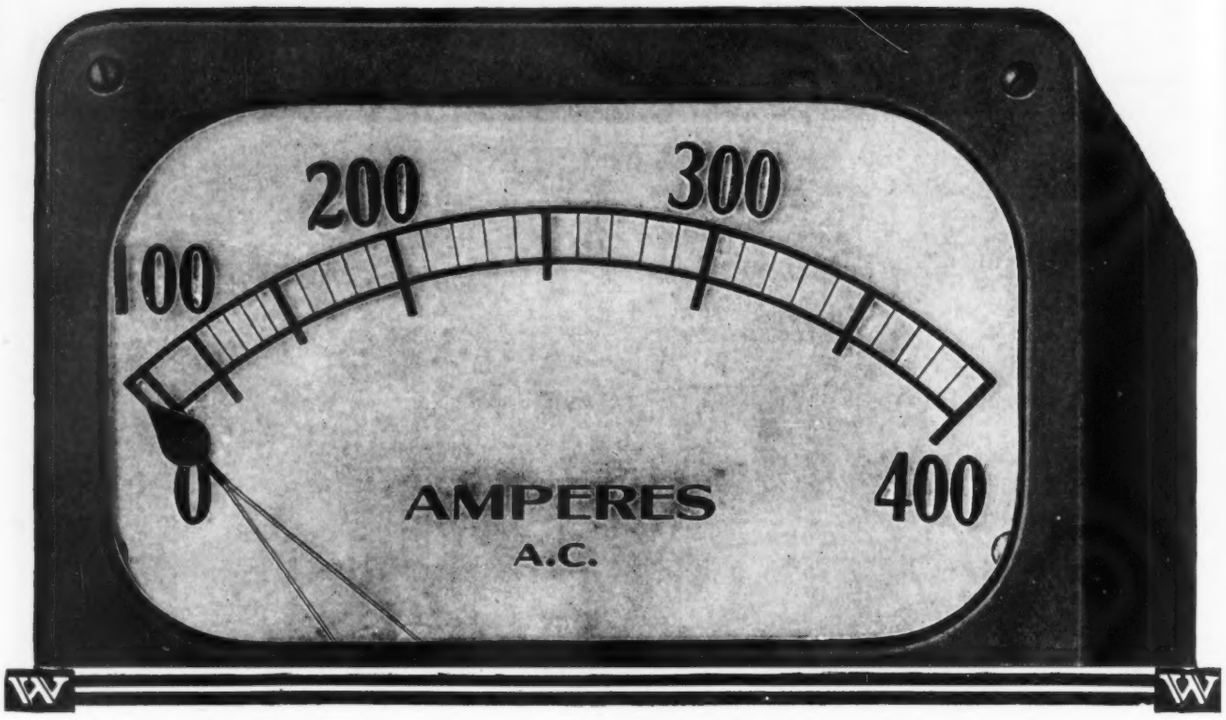

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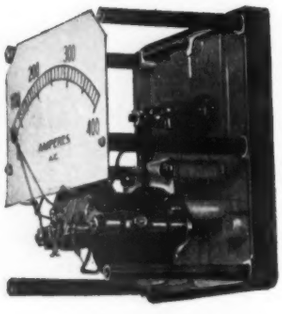

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Published by McGraw-Hill Company, Inc.

W. H. ONKEN, JR
Editor

HAROLD V. BOZELL
Editor

Volume 84 New York, Saturday, August 30, 1924 *Number* 9

Impelling Causes Resulting in Public Utility Prosperity

SPEAKING in the language of the street, the electric light and power industry is at present "sitting pretty." Years of painstaking labor and service have brought recognition of merit and appreciation of enterprise. Naturally this has been reflected in the enhanced value of securities and has resulted in greater stability. Why the electric light and power industry should be so signally successful is not hard to guess. The impelling causes which have resulted in greater public good will and prosperity—and this, after all, is the ultimate good of the industry—have been epitomized by one of the outstanding men of this country as follows: (1) Increased wages; (2) lower rates or better service at the same rates; (3) steady return, not necessarily high, to attract capital. Measured by these criteria, it is easy to account for the prosperity or lack of prosperity of any utility or industry. Of the major industries, the electric is probably freest from labor disturbances. This is particularly true of the electric light and power industry, which does not employ much labor and in which particular pains are taken to keep that labor happy and satisfied. As for rates and service, statistics and experience show the former to be lower than ever and the latter to be improved. Compare this situation with that obtaining on the steam railroads of the country, for example. The third consideration has recently impressed itself on the minds of investors, and as a result there has been feverish buying of electric public utility securities. Moreover, the cost of money to the industry because of its record is gradually declining, and inasmuch as the electric light and power companies of the country require huge sums yearly, cheaper money is a blessing of great worth.

Viewing History Under Electric Light

THE presence of electric lighting in many of the most famous shrines of American history attracts little attention from the thousands of visitors who at this season register in these venerable museums and buildings, but its unobtrusive installation serves the tourist and safeguards his steps in unfamiliar surroundings. Lamps energized from distant central stations protect priceless relics of past centuries, and modern wiring concealed in conduit provides fireproof illumination service in precious wooden houses dwelt in by Pilgrim and Revolutionary heroes. That no marring incongruity offends good taste when a Mayflower table is viewed by a twentieth-century tungsten lamp hung from ancient beams in the living room of a John Alden homestead is indeed a wonderful testimonial to the utility of incandescent lighting under most exacting demands. Surely kerosene and gas would be anachronisms in such locations! These fine old relics of our early history are seemingly the last strongholds of conservatism, and when electric utility service is adopted for their preservation and better exhibition a challenge is issued to all other unwired buildings. They furnish off-peak loads of considerable duration to the central-station company with an alert and sympathetic management.

Convention Season for Public Utility Associations

SEPTEMBER is a great month for conventions. The summer resort season being over, associations of public utility men, which are always hard put to find proper and adequate hotel accommodations, arrange to have some of the largest resort hotels in the East and Middle West remain open a week longer for convention purposes. This has many advantages. It enables state associations or geographical divisions to meet outside of the big cities with their many allurements and therefore to concentrate easily on the work of the convention. Opportunity is also afforded for recreation and outdoor entertainment. The hotels being occupied almost exclusively by convention delegates, there is every chance for the extension of acquaintance and the interchange of ideas.

The list of coming meetings printed in the ELECTRICAL WORLD shows eleven large gatherings of electrical men scheduled to be held in the East, the West, the North and the South in September, eight of them in mountain, seashore or other resorts. They will doubtless all be well attended. Electric light and power companies will surely not fail to see the great advantage to be gained by facilitating and insisting upon as many representatives from both their engineering and their commercial departments as can possibly be spared going to these conventions. These men cannot fail to profit by intercourse with others who confront like problems, as well as by listening to and, still better, by active participation in the discussions, and what they gain must redound to the benefit of the central-station companies and the industry at large.

Summer Conferences Between Teachers and Men of the Electrical Industry

CONFERENCES of a few weeks' duration were held recently in East Pittsburgh and Schenectady between professors of electrical engineering and the engineers of our two largest manufacturing companies. A similar conference, of a week's duration, took place in the main offices of the American Telephone & Telegraph Company in New York City. Matters of technical, scientific, economic and pedagogical interest were freely discussed, but above all the details one idea stood out supreme. The electrical industry is one, and its various branches and forms of activity are so closely dovetailed that it is impossible for a responsible person in one branch to be ignorant of the problems of the

others. For example, the telephone officials had to learn about the teachers' difficulties, and the teachers had to be told by the designers of power machinery not to give specialized courses in design. The sense gained in this way of unity, prospective, mutual helpfulness and broad responsibility has been, perhaps, the most valuable outcome of these conferences.

It may be hoped that next summer the operating power companies, through the National Electric Light Association, will plan a similar conference, or, still better, three conferences in different parts of the country. These conferences could be timed to come simultaneously with important regional meetings of operating men, thus establishing a closer contact with the teachers. No wise man will believe that operating details should be taught in colleges in place of the sound fundamentals. None the less, through such conferences teachers will learn to appreciate operating problems better, while practical operating men will learn that professors of electrical engineering are doing their best with the limited time and other handicaps over which they have no control.

Better Engineering Needed in Motorization

DATA collected in many localities show the existence of a great amount of excess motor capacity in industrial plants. Other data show a woeful lack of engineering in industrial motor installations. The wrong type of motor is often used, motors are incorrectly connected, many reconnected or second-hand motors are used which have poor characteristics, and too frequently power-factor corrective equipment has been "sold" and not "engineered." This kind of practice results in a great economic loss to both the central stations and the factories. It has existed for a long time and is well known, and yet little definite work has been done to remedy the conditions. Attention to the matter will surely bring results that will rank with those obtained from economic studies of power production, transmission and distribution. There are at least four agencies available for work on this problem—the central station, the motor manufacturer, the factory electrical engineer and the consulting engineer. Greatest results will ensue if the central-station company takes the initiative and assumes the responsibility. It has most to gain and is in the best position to initiate and supervise the work. Second to the central station are the motor manufacturer and his representatives.

There is no economic obstacle to overcome, and there are many economic rewards in prospect if each plant using electricity is properly motored and each motor sold is properly suited to the prospective work. Central-station power salesmen should look upon each power installation as an engineering job as well as a source of income and should, through advice, test data and co-operative work with the other agencies, insure the installation of suitable motors. Motor salesmen can well afford to study the conditions under which purchasers contemplate using new motors. To do so is merely to apply intelligence to a competitive situation. There is all to gain and nothing to lose.

It is rather startling to contemplate the economic and operating results that can be realized if the central station in each territory will take the initiative in bringing about co-operative efforts to improve the motorization of industry.

Station Control Becoming Subdivided

IT HAS long been customary to call the operating room of a power station the nerve center, but the trend of development in recent years is away from this conception of the station's main switchboard. The two things that have brought about the changed view are the increased size of stations and the growth of interconnection. With a large station built on the unit principle both econoomy and reliability dictate simplification in the operating room. It is becoming good practice to have only absolute essentials in control and metering, because even under these conditions it is difficult to observe the meters or operate the controls required in a large station. Local controls, automatic equipment and sub-operating rooms become advisable as the magnitude and complexity of stations increase. With the growth of interconnection the nerve center of the system becomes the load-dispatcher station. The dispatcher must have direct or indirect control of all the main feeders on the system, and the simpler the arrangements for providing this control the less the cost and in general the more reliable the service.

It is not possible to standardize the operating-room apparatus for a station of given size, and each piece of equipment calls for a distinctly different design governed by local and system conditions. But the trend toward subdivision in control and simplicity in main switchboard equipment is very noticeable, and these elements should be considered carefully by designers of a new station.

Burning of Coal in Oil Country —Its Significance

WHEN many operating companies remote from oil fields are beginning to consider the burning of oil in power plants, it is rather significant to observe that at least one large company in Texas and another in Oklahoma, where oil is plentiful, have decided upon or are considering the installation of coal-fired boilers. This is being done despite the fact that all other generating plants on these companies' systems are at present fired by either oil or gas and have been operating very satisfactorily. There are no technical objections to oil or gas firing, and, furthermore, these methods have recognized advantages.

Some utilities give as the reason for preparations to burn coal the fact that the price of oil so frequently goes above the value at which it is economical. Whether decisions to burn coal instead of oil are due alone to the relative price of the fuels and can be adjusted by the producers and distributors to change the situation, or whether companies fear that the supply of oil in sufficient quantities for central-station consumption will not last very long, remains, however, a question for speculation. A belief that a dependable supply of fuel oil will not be available much more than ten to fifteen years is entertained by some companies. Others look upon the use of coal with favor because of the relative prices of fuel per kilowatt-hour produced at present market prices. The availability of lignite in Oklahoma and northern Texas and the adaptability of this fuel to large plants with modern burning methods no doubt also have an influence.

In Texas one of the large new plants which have been built for oil combustion has been designed so that it

can be easily converted to coal burning, and the next plant on the system will undoubtedly burn lignite. It has not been decided whether the lignite which is available will be burned in powdered form or whether it will be burned on stokers. In Oklahoma, where a very good grade of coal is available, additions to one of the most modern plants in the state will consist of stoker-fired in place of the oil-burning boilers, which had previously been used in this plant as well as in others on the system.

If oil at the price for which it can be obtained in Texas and Oklahoma must take a back seat in favor of coal burning, it seems to indicate that power plants in parts of the United States where oil is less readily obtainable should, before making a change in fuel, carefully investigate the relative costs of coal and oil burning in the Southwest. Of course, the availability of fuel oil from different fields and the receipt of it by tank ships may have a tempering influence. Companies will take into consideration also the transportation charges on both kinds of fuel, the relative availability, regularity of supply and limitations on storage.

Improvement in Telephone Receivers

RECENT technical literature has contained several important contributions bearing on the problems of the telephone receiver and transmitter. Attention has been drawn in these columns to the disproportionate advances in transmission methods and in the methods of transfer between sound and electrical energy in the art of telephony. Improvements in the methods of transmission have far outdistanced those in the transmitter and the receiver.

The problem of transfer between speech and electrical energy—that is, the placing on an electric circuit of a current which shall correspond to all of the variations of speech—is a particularly difficult one. The question of quality, involving as it does such a varied range of frequencies and amplitudes, is sufficiently serious. It is possible, however, that a satisfactory solution in this regard could be met if only the energy content of the periodic motion of the air were not so extremely small. This appears to be the vital difficulty in the reciprocal transfer between electrical and speech reproduction. At a frequency of 256 the ear detects as sound a periodic change in air density of about one hundred-millionth of an atmosphere, and we appreciate an amplitude of motion of an air particle of one or two millionths of a millimeter and an energy stream of one to three microergs or so per square centimeter per second.

At first sight it seems almost hopeless to expect to reproduce variations of this type in an electric circuit and to detect this variation at the other end. That the microphone transmitter and Bell receiver with their relatively enormous masses should respond at all is very remarkable, and their imperfections are not to be wondered at. Experimental science is not to be denied, however, and the attack on the problem of the telephone receiver goes on. Two types operating on the thermal principle have been proposed. In one a loop of very fine wire is inclosed in a small capsule with exit holes. When telephonic speech currents are sent through the wire, it is heated and the sudden expansion of the surrounding air generates sound waves which make their exit from the holes. Another type of thermal receiver is that in which a ball or point is in contact with a small disk on the back of an aluminum diaphragm. A small direct current is passed across the contact and telephonic speech current is superimposed, the diaphragm being thereby set in operation. Another principle that has been invoked is that of the electrostatic or condenser transmitter, consisting of a fixed flat plate, parallel to which at a very short distance is held a thin, tightly stretched steel disk. When an alternating potential difference is applied to the plates, they vibrate and emit a musical sound. The electrical constants of this instrument can be determined, and it has proved especially valuable in research for determining the characteristics of different types of sound waves.

Still another principle now being explored is that of the variable friction between certain types of surfaces when brought into contact. When direct current is sent through the combination consisting of a plate of highly polished agate and a polished metal plate in intimate contact with it, there results a remarkably strong adhesion and frictional resistance between them. Giving a cylindrical form to the agate and using a flexible friction band for the other terminal, the steady friction between them, when the cylinder rotates, responds in a remarkable degree to telephonic speech current superimposed on the direct current passing between the two elements. This variable friction is readily communicated to various types of vibrating systems, including the ordinary telephone receiver, and especially those of the loud-speaking type.

More attention appears to have been given the receiver than the transmitter. The condenser transmitter has been used considerably for wireless broadcasting, but it should not be lost sight of that some principle other than that of the vibration of a mechanical system should be sought if all of the varieties present in vocal sound are to be reproduced. For this reason a glow discharge microphone, recently announced, in which the speech air waves directly modulate an electric discharge current, appears to have possibilities. None of these efforts can yet be said to threaten the replacement of present equipment, but all of them are indications that the opportunity for great contributions to the telephonic art is well to the fore in the minds of research engineers.

Standardization and Simplification Prove Their Worth

INTEREST and activity in industrial standardization and simplification have never been greater than at present. The technical groups under the leadership of the American Engineering Standards Committee have accomplished a great deal, having placed thirty-one projects on an official status. Of these, fifteen deal with electrical engineering. The industrial groups under the leadership of the Department of Commerce have done much to secure simplification in production. It is encouraging to note that these two agencies cooperate fully and tie their efforts together.

Experience with standardization and simplification indicates they do not produce stagnation in development and progress. They do not stifle initiative or stunt growth. They serve to fix the things that have been accomplished and to permit the thought and energy of engineers and executives to be devoted to bringing about new developments and new methods for the service of industry.

An All-Electric Hotel in Buffalo

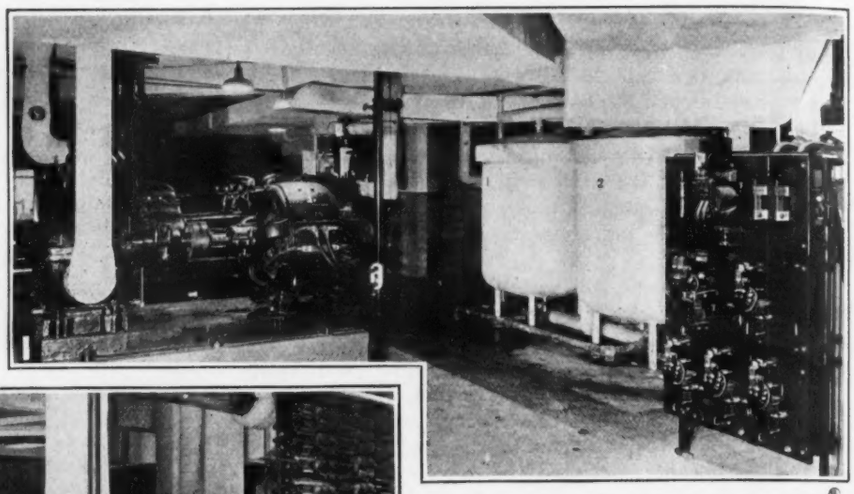
No. 1—A 100-hp. motor-driven brine pump with automatic control panel.

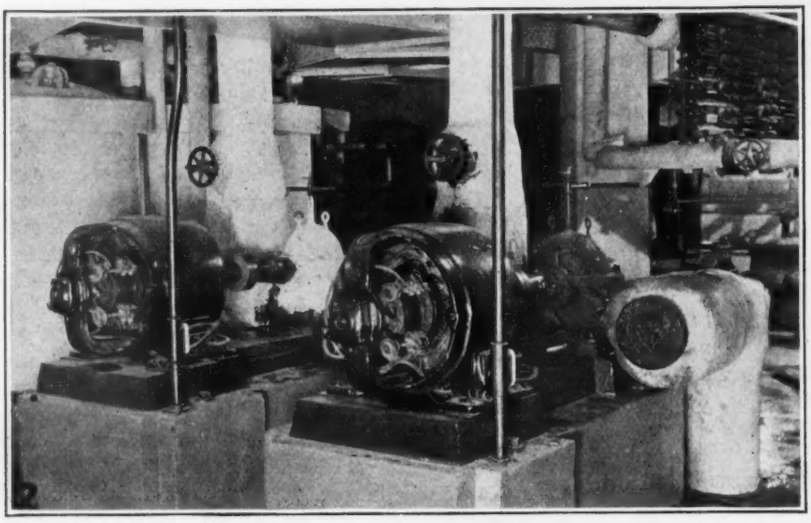
No. 2—An installation of motor-driven brine pumps.

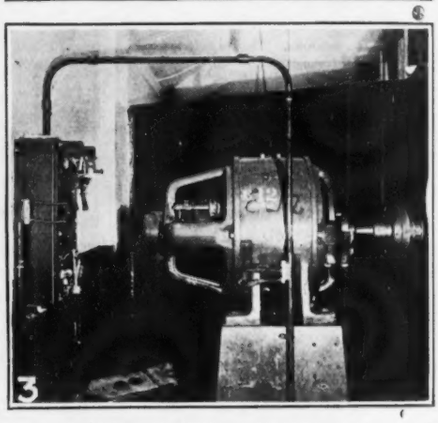
No. 3—Motor-driven ventilating fan with speed regulator.

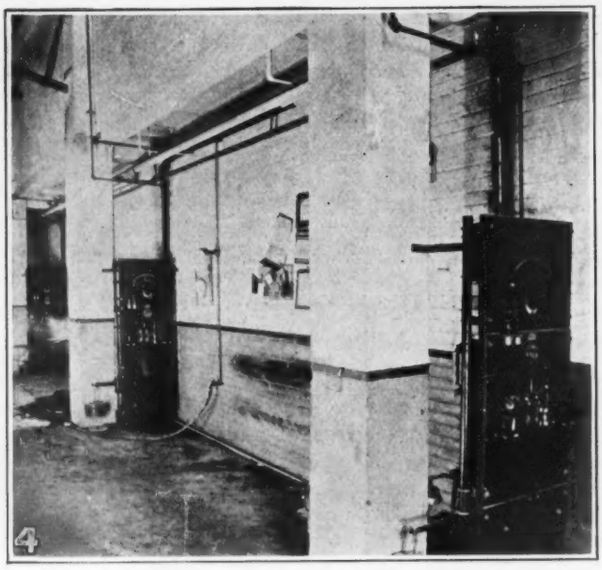
No. 4—An installation of automatic pressure regulators in the boiler room.

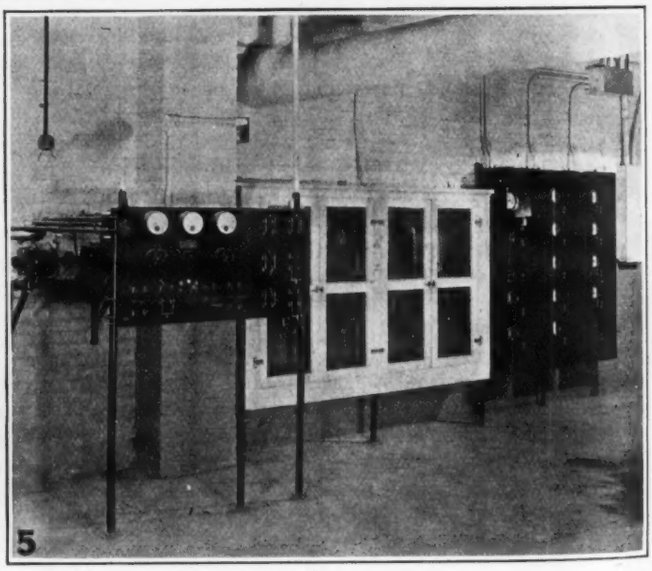
No. 5—A low-voltage installation for the clock and signal devices.











Central-Station Service Most Reliable and Most Economical

AFTER carefully studying the relative merits of central station and private plant service the designers of the new Statler Hotel in Buffalo decided to use an all-electric installation with energy supply from central stations. Reliability of service was a primary consideration in this decision, but in addition analyses showed that a decided yearly saving would result.

As an example of intricate light, power, signal and communication circuit installations this hotel should prove interesting to electrical engineers. More than 2,000 hp. is utilized in lighting and motor service, and in addition annunciator, telephone, telegraph, fire alarm, radio and signal circuits are installed for the convenience of the operating staff and the guests. Many automatic devices are used to secure reliable service under all conditions.

Modern Hotel Electrification

New Statler Hotel in Buffalo Uses More than 2,000 Hp. in Lighting and Motor Service—General Design Principles and Typical Installations of Motors, Cables and Signal Systems

By KARR PARKER
Engineering Manager McCarthy Brothers & Ford, Buffalo, N. Y.

WHAT the electrification of a large building means can be well illustrated by using a hotel as a model, because of the diversity and magnitude of the uses of electricity in such an installation and because service reliability is of paramount importance.

The completion of the new Hotel Statler in Buffalo, N. Y., marks one of the latest achievements in hotel buildings. Hotel men who have inspected this structure express the opinion that it is very carefully planned and splendidly equipped. The hotel is on Niagara Square at the site of the proposed Civic Center. It has a total height of nineteen stories and covers an entire city block. Three wings with a capacity of 1,100 rooms on the Delaware Avenue side have been carried up to the full height, but the Genesee Street wing has been built only three stories high at present, with the substructure of sufficient strength to permit the building of this section up to nineteen stories in the future. This will provide 500 additional rooms.

Electricity is utilized throughout this hotel to an unusual degree, and a most extensive and elaborate electrical installation has been provided. From the radio station on the roof to the submerged sump pumps in the basement the hotel is completely electrified, and, in fact, its operation would be impossible without the aid of electricity.

Isolated Plant Not Used

A very careful study was made of the comparative merits of central-station and isolated-plant service when the power plant was designed. In the operation of a hotel reliability of service is of first importance, because any interruption in the electric light and power supply would entirely disorganize the hotel. But a modern hotel requires daily an enormous amount of both high-pressure and low-pressure steam, and it was urged that under such conditions an isolated-plant installation would prove more economical.

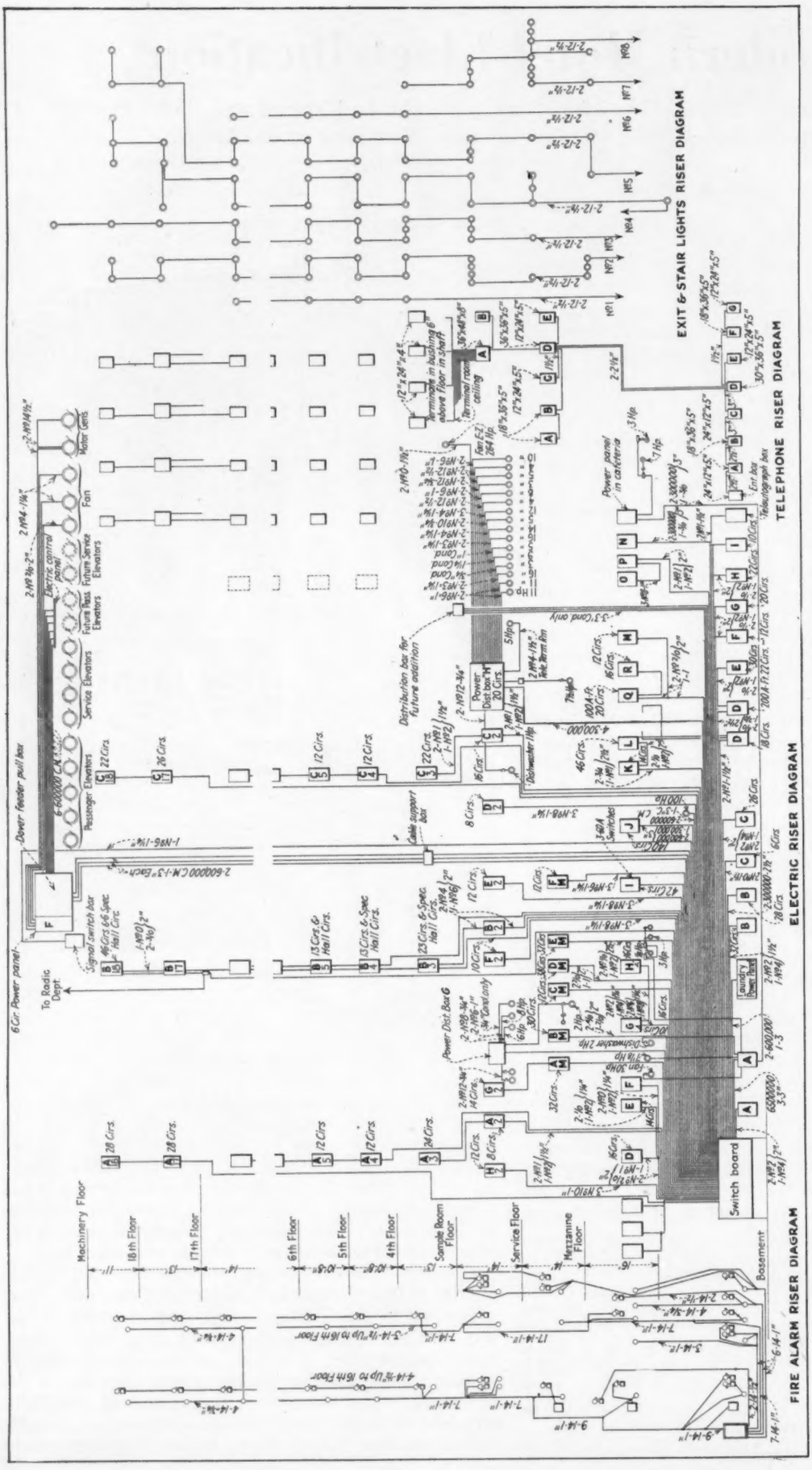
Low-pressure steam is required, of course, during cold weather for supplying the heating system. It is also required for heating water, tremendous quantities of which are used in a large hotel. High-pressure steam is required for the kitchen and also for the laundry. It was originally intended to install a large battery of water-tube boilers for generating high-pressure steam to take care of these requirements and to install turbo-generators for generating the electricity required, the exhaust steam from these generators being utilized as far as possible in the hotel. A careful study, however, of the conditions revealed the fact that the daily load curve of the electrical requirements was entirely different from that of the steam requirements. At certain times the electrical load would be heavy and a large amount of steam would be exhausted from the turbo-generators but could not be utilized because the steam requirements were low at that particular time.

Further tests on the old Hotel Statler in Buffalo showed that a considerable amount of steam was being exhausted to the atmosphere at certain hours of the day, particularly during the summer time. It was therefore decided that it would be more economical to abandon the idea of installing a generating plant in the hotel and to purchase the entire amount of electricity required from the central-station company. It is estimated that this will result in a saving of approximately

NEW HOTEL STATLER IN BUFFALO

COMPARATIVE ANNUAL OPERATING COST FOR POWER PLANT OF A 400-ROOM HOTEL

	Steam	Electricity
Coal, at $5 per ton delivered in bin	$36,200.00	$18,950.00
Electricity (87,500 kw.-hr. per month)	0	6,120.80
Labor (direct only)	8,280.00	6,960.00
Oil and waste	608.44	352.00
Repairs	890.00	510.00
Sundries	309.00	178.00
	$46,287.44	$33,070.80
Net saving per year by using electricity	$13,217.36	.....



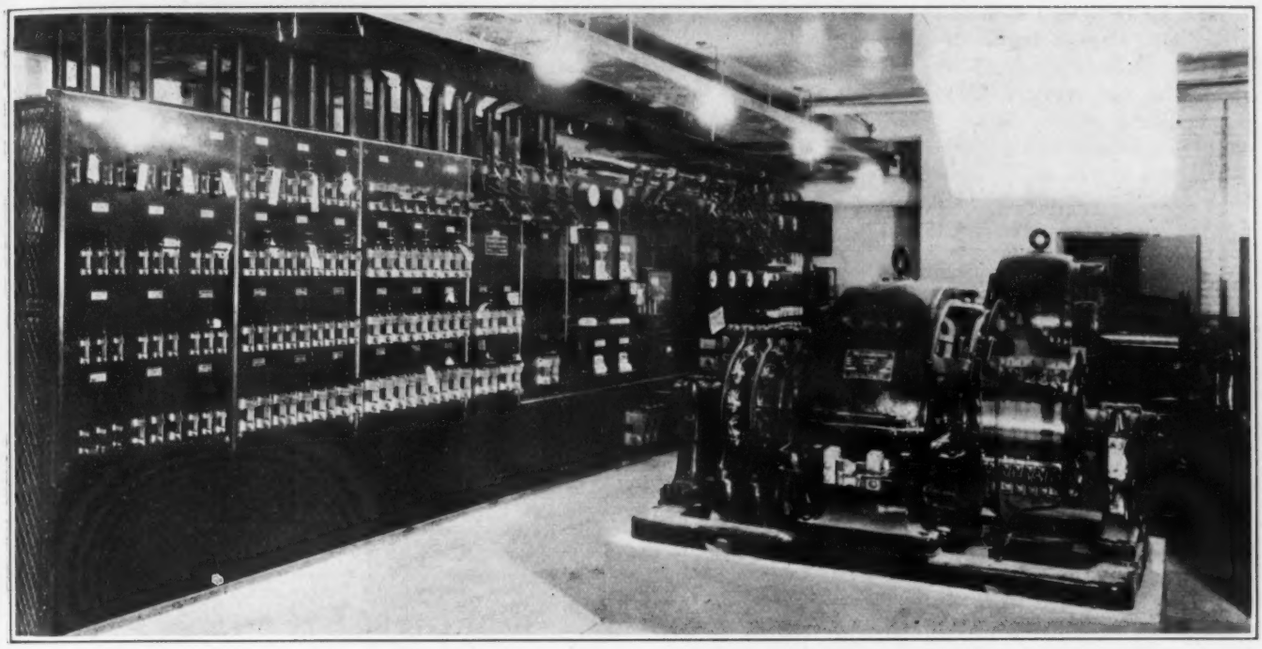
VERTICAL RISERS FOR THE LIGHT, POWER AND TELEPHONE CIRCUITS

$50,000 per year in the operation of the new hotel. A complete electrification was made in the plant of the old Statler Hotel, now known as the Hotel Buffalo, and a large saving was effected.

An example of the saving that was actually effected in a certain 400-room hotel by the use of central-station energy in place of isolated-steam-plant power is noted in the table.

The alternating-current service from Niagara Falls—three-phase, 25 cycles, 2,300 volts—is brought in underground to the substation in the hotel basement on duplicate feeders. There is also an emergency connection to the direct-current Edison three-wire, 220/110-volt circuit of the Buffalo General Electric Company. This connection can be used in an emergency should the alternating-current service fail. The total capacity provided by the present installation is 2,000 hp., with provision for future increase.

The 2,300-volt, three-phase, 25-cycle service is brought into a fifteen-panel switchboard in the engine room in the hotel basement. The switchboard controls all the apparatus in the hotel and is fitted with automatic oil switches, circuit breakers, etc., and a very complete set of graphic and integrating meters. These meters en-



MORE THAN 2,000 HP. ENTERS THIS SUBSTATION AT 2,300 VOLTS, 25 CYCLES, FROM NIAGARA FALLS

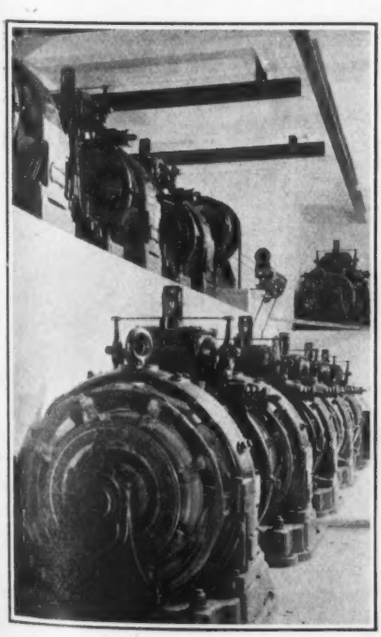
Rotary converters produce the direct-current supply, and in addition an emergency connection to the Buffalo General Electric Company direct-current system is available

able the hotel management to charge each department of the hotel with the energy used in that department. The primary current is reduced to 187 volts, six-phase, in a bank of transformers, and is fed to the rotary converters, where it is changed into direct current, 230/115 volts, for the Edison three-wire system used throughout the hotel. There is a separate bank of transformers for the garage which will operate on alternating current.

The hotel contains approximately 1,800 hp. connected load in 230-volt direct-current motors from ½ hp. to 100 hp. From the operating records of the electrical load since the hotel was opened May 19 it is calculated that the total yearly consumption of electricity will be approximately 4,800,000 kw.-hr.

In view of the fact that the current supplied was 25-cycle energy, it was necessary to consider the question of alternating current versus direct current for the use of the hotel. Direct current was required for the elevator system and for the laundry motors, which were in many cases fitted with automatic reversing control and a wide range of speed variation. Direct current was also desirable for the ventilating fans, which would have lower rheostat losses if the speed variation was obtained by shunt-field control on direct-current motors. There was some objection also to the use of 25 cycles for lighting, so it was decided to convert all of the energy required into direct current for use in the hotel, although this would require a large investment in rotary-converter equipment.

The hotel has an elaborate ventilating system with ducts running throughout the building. The ventilating fans require a total of twenty-five motors in sizes

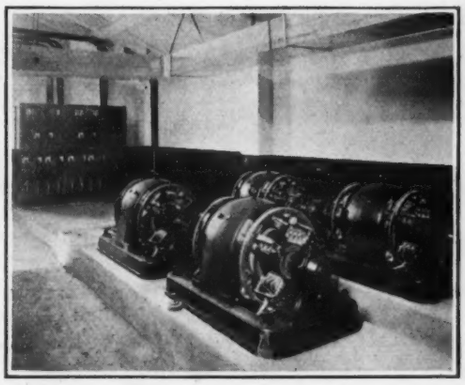


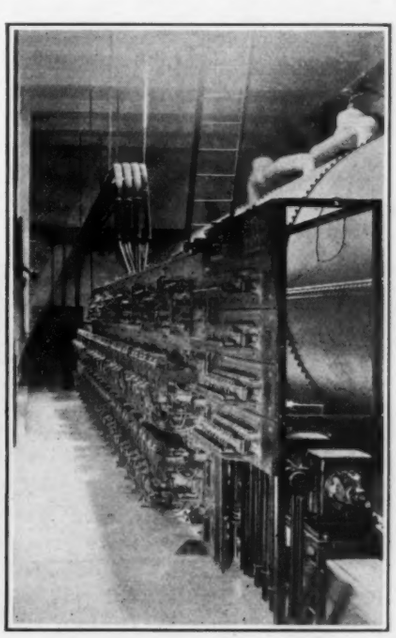
A MODERN ELEVATOR INSTALLATION

At left—A battery of the gearless traction elevators.

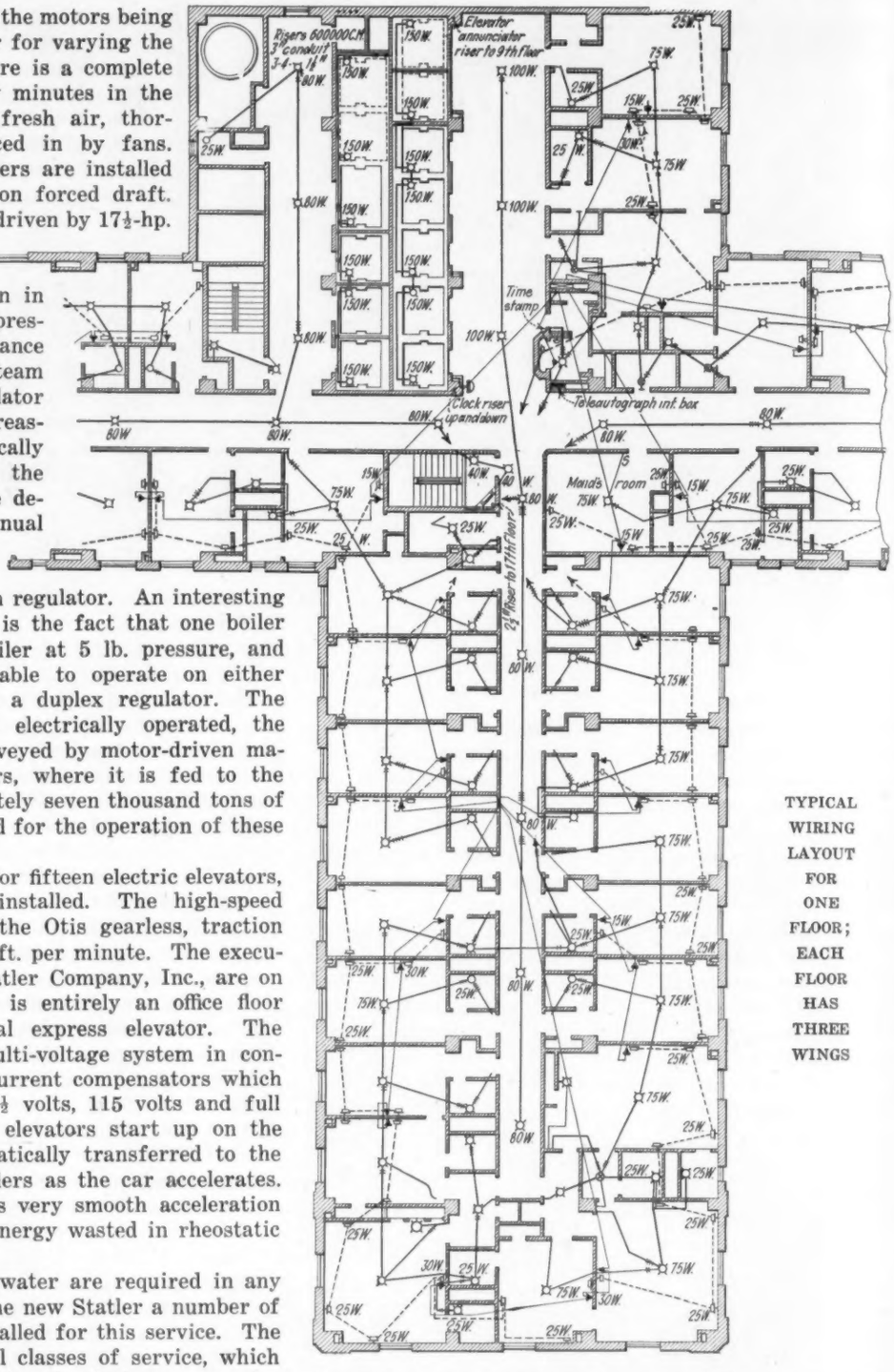
At right—Control board for the high-speed passenger elevators, which operate at 600 ft. per minute.

Below — The elevators operate on a multi-voltage system, using direct-current compensators giving 57½, 115 and 230 volts.





from 5 hp. to 30 hp., each of the motors being fitted with a speed regulator for varying the speed by field control. There is a complete change of air every twenty minutes in the public parts of the hotel, fresh air, thoroughly washed, being forced in by fans. Three 500-hp. B. & W. boilers are installed with stokers for operation on forced draft. These forced-draft fans are driven by 17½-hp. motors with automatic speed regulators which control the speed of the fan in accordance with the steam pressure by varying the resistance in the shunt field. If the steam pressure fails, the regulator speeds up the fan, thus increasing the draft and automatically reducing the speed when the steam pressure rises to the desired value. A duplicate manual speed regulator, with double-pole, double-throw switch, is provided with each regulator. An interesting feature of these regulators is the fact that one boiler operates at 100 lb., one boiler at 5 lb. pressure, and the third boiler must be able to operate on either pressure and therefore has a duplex regulator. The coal-handling equipment is electrically operated, the coal being crushed and conveyed by motor-driven machinery to overhead bunkers, where it is fed to the stoker hoppers. Approximately seven thousand tons of coal per year will be required for the operation of these boilers.



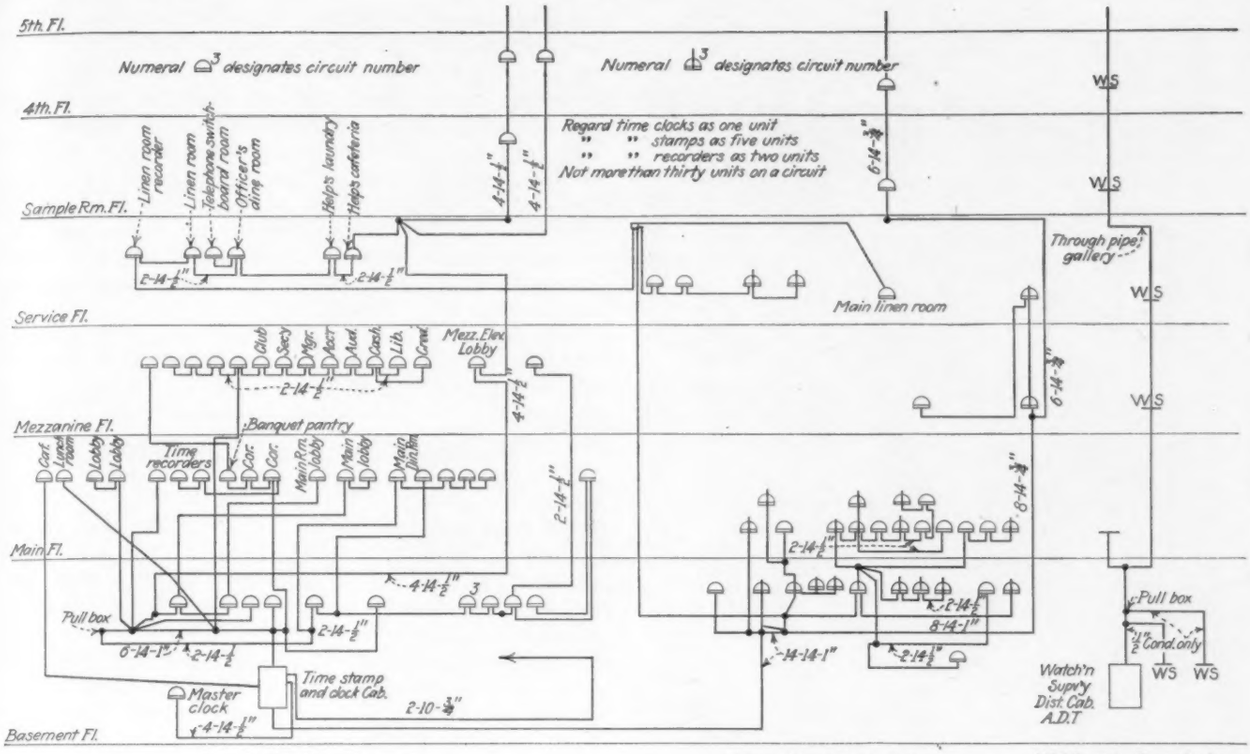
TYPICAL WIRING LAYOUT FOR ONE FLOOR; EACH FLOOR HAS THREE WINGS

Provision has been made for fifteen electric elevators, eleven of which are now installed. The high-speed passenger elevators are of the Otis gearless, traction type, having a speed of 600 ft. per minute. The executive offices of the Hotels Statler Company, Inc., are on the eighteenth floor, which is entirely an office floor and is served by a special express elevator. The elevators operate on the multi-voltage system in connection with rotary direct-current compensators which establish, through buses, 57½ volts, 115 volts and full voltage of 230 volts. The elevators start up on the 57½-volt bus and are automatically transferred to the higher buses by the controllers as the car accelerates. This method of control gives very smooth acceleration and reduces the amount of energy wasted in rheostatic controllers.

Very great quantities of water are required in any large modern hotel, and in the new Statler a number of motor-driven pumps are installed for this service. The units are in duplicate for all classes of service, which includes filter pumps, ice-water-circulating pumps for supplying ice water to all guest rooms, brine pumps on the refrigeration system, sump pumps, house pumps, etc. The house-pump unit consists of a 1,700-r.p.m., 100-hp. motor directly connected to a three-stage, 5-in. centrifugal pump which discharges into large steel tanks placed above the top floor of the hotel. Float switches in these tanks control the 100-hp. motor through a magnetic control panel, and a constant water supply is automatically maintained at all times. There is also a steam pump in reserve for this service.

An interesting feature of this hotel is the fact that it is built on quicksand. It was necessary to drive hundreds of piles 40 ft. into the sand to provide the foundation for the steel structure. The basement is arranged with sumps into which the overflow of water from this bed of quicksand is discharged. These sumps are kept clear by means of vertical centrifugal pumps directly connected to motors. The pumps have automatic controllers and operate day and night in order to keep the water in the sumps down to the proper level.

The lighting installation of the hotel is very elaborate, the fixtures in the different parts being designed to harmonize with the style of the room. The lobby and palm room are finished in the style of the Italian Renaissance and have walls 28 ft. in height built entirely of Botticino marble imported from Italy. The large lighting chandeliers and side brackets in these rooms



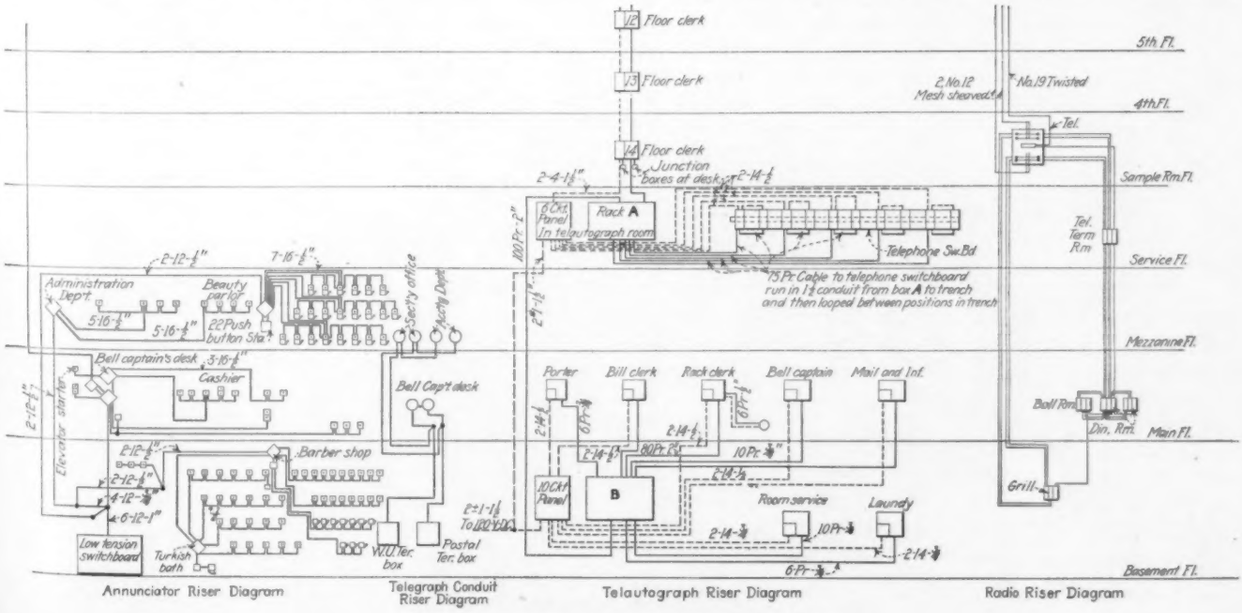
TIME CLOCK AND WATCHMAN'S CIRCUITS AND RISERS

are finished in wrought iron and polychrome. There are more than 25,000 lamps in various sizes installed throughout the hotel. A marquise with decorative lighting is provided at each of the four entrances.

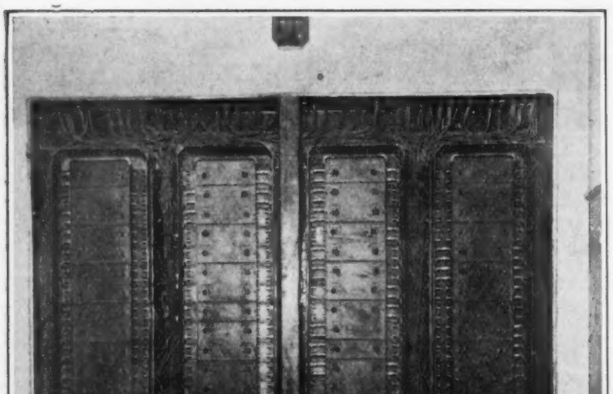
The lighting system in the room floors is fed by six risers. All of the lighting panelboards are of the "full safety" type of construction with toggle switches, all live parts being under lock and key with double-door construction. A total of 125 panelboards of various sizes was required. The ballroom contains a well-equipped stage with switchboard and dimmers, together with a motion-picture booth.

In the drawing which gives the layout of a typical room floor, it will be observed that each wing is fed by a separate 400,000-cir.mil feeder to a distribution panel in the stairway well. The riser diagrams for the various systems are shown in other illustrations and consist of the following main divisions: Electric risers, telephone risers, fire alarms, exit lights, time clock, time stamp, watchmen's system, annunciator risers, telegraph risers, telautograph risers, and radio risers.

Complete duplicate motor-generator equipment and storage batteries are installed for supplying the low-voltage fire-alarm and signal systems. This equipment



RADIO, TELEPHONE AND SIGNAL RISER DIAGRAMS



AN UNFINISHED INSTALLATION OF A 140-CIRCUIT SAFETY-TYPE DISTRIBUTION PANEL

operates at 28 volts. One of the most complete installations of signal devices, such as telautographs, time-recording stamps, watchmen's recorders and other aids to speed and accuracy, that have ever been made is found in this hotel. Telautographs connect all of the offices and also with the floor clerks and the executive offices.

A nine-position telephone switchboard is installed requiring sixteen operators to handle the calls. More than 380 miles of wire was required to connect the 1,200 telephones in the hotel, and forty trunk lines are required to connect the hotel telephones to the central office of the local telephone company.

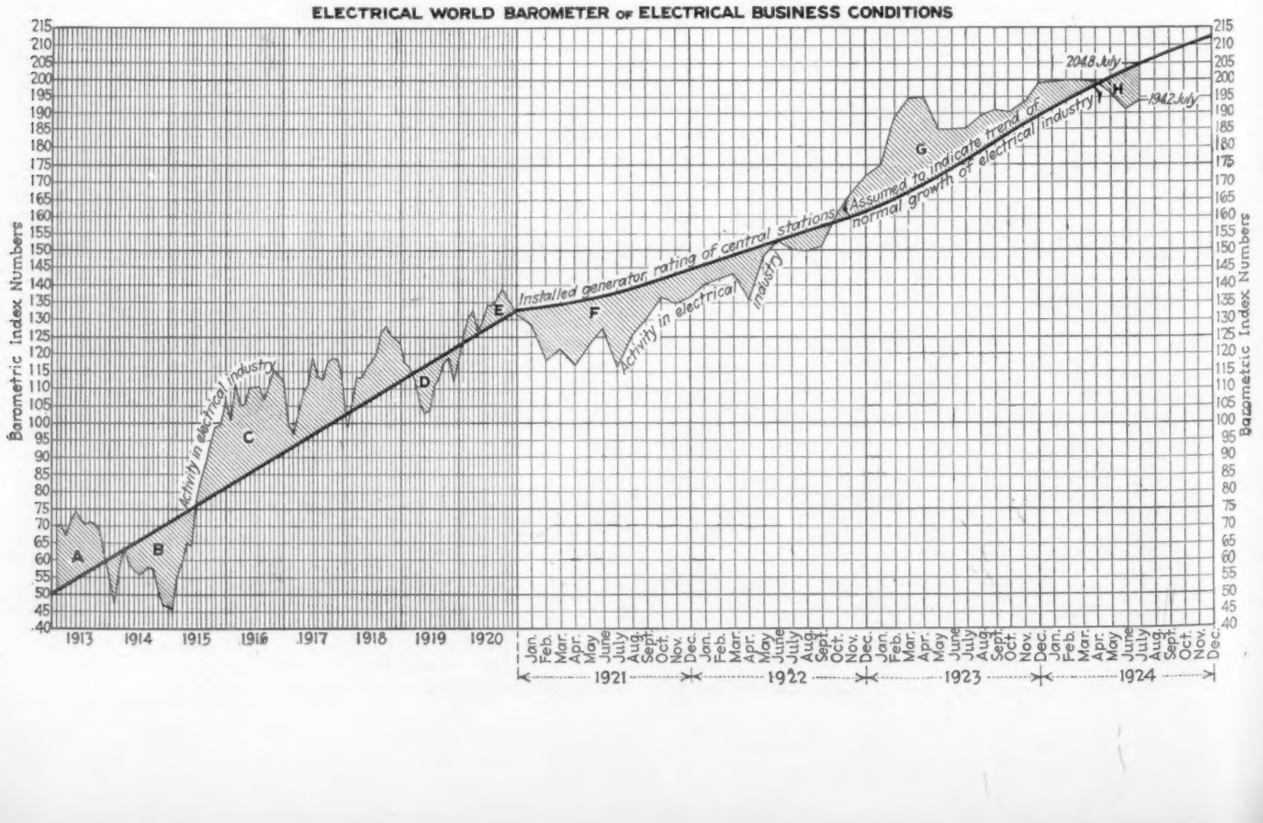
A complete 3,000-mile radio broadcasting station, "WGR," is maintained on top of the hotel. A large studio and a reception room are provided, and connections are run to the various dining rooms and to the public rooms located on the lower floors so that programs can be broadcasted as desired from any of these rooms.

The architects of the building were George B. Post & Sons, the mechanical engineers were Tenney & Ohmes, and the electrical engineer was J. F. Musselman.

Decided Turn for the Better During July

FIGURES upon which the "ELECTRICAL WORLD Barometer of Business Conditions in the Electrical Industry" are based indicate that during July the downward tendency in business activity which had been prevalent throughout the industry since February was almost entirely checked. This was indicated not only by the activity of industries outside the electrical industry, but also by the activity of the electric light and power branch of the industry. Incomplete returns indicate that increased activity prevailed also during August.

An increase of 2.1 points on the barometer scale, as compared with June, is shown. During the interval the industry has grown 2.5 points, making a net decrease in activities of 0.4 point on the barometer scale as compared with June. The electrical industry as a whole was, therefore, operating during July at 10.6 per cent below what would have been the point of seasonal demand if growth in the industry had been normal. In June it was operating at 10.2 (revised) per cent below and in May at 4.2 per cent below the point of normal demand.



Regulator Settings for Long Lines—I

Automatic Voltage Regulator Can Be Used to Arrive at Desired Operating Characteristics—Theory of Performance, Example of Application and Analysis of Requirements

By L. F. WOODRUFF
Massachusetts Institute of Technology

POWER-CIRCLE diagrams have been very useful in studying the steady operating characteristics of long transmission lines, but the use of such diagrams has been limited in scope because heretofore there has not been available a solution when the voltage at the generator end is controlled by a compound-wound voltage regulator. The solution for this case is presented here, including, as the limiting case of zero compounding of the generator voltage regulator, the now familiar circle diagram of power for constant voltage at both ends of the line. An experimental way of determining the circle diagram is pointed out. A numerical example is worked out, and detailed directions are given for setting the voltage regulators to obtain the desired operating characteristics.

THE inherent voltage regulation of a long transmission line is so poor that special apparatus has to be installed to keep the load voltage nearly constant. For small blocks of power induction regulators have been useful, but they are not suitable for large amounts of power. When the maximum amount of power transmitted is very large—as it always is on a long line, for economic reasons—the load voltage may be regulated in three ways:

1. By adjusting the amount of reactive power taken by the load so that the line drop (i.e., the arithmetical value of the generator-end voltage minus the load-end voltage) is always the same. This is accomplished by operating a synchronous condenser in parallel with the load, the field excitation of the condenser being controlled by a suitable voltage regulator.

2. By controlling the generator voltage, adjusting it so that as the load increases the generator voltage increases by the amount of the increased line drop. This regulation is accomplished by controlling the generator-field current with a line-drop compensator and a shunt-wound voltage regulator or with a compound-wound voltage regulator.

3. By a combination of the above two methods.

There is also the possibility of installing synchronous condensers near the center of a long line, but this may be looked upon as breaking the line into two separate lines, each of which will be controlled by one of the above three methods.

A complete solution and a clear graphical representation of steady conditions on a line controlled as indicated in (1) are given by the usual type of power-circle diagram. However, there is no justification for making an *a priori* assumption that the best method of operation is to hold constant voltage at the generator end of the line, unless the line is only a link in a network through which power may flow either way. If the line is a long one connecting a definite source of supply of power with a definite load center, a thorough graphical study of the operating characteristics can be made only with the aid of a diagram which is capable of representing conditions on a line controlled as described in (3) above, a complete solution for this case including also, as limiting cases, the solutions for cases (1) and (2). In the remainder of this paper control as described in (3) is to be understood, with possible inclusion of the limiting conditions.

The mathematical solution for the steady voltage and current relations which will obtain at the ends of a long transmission line may be considerably simplified by first replacing the circuit of line and terminal transformers by its equivalent Π line. It is well known that a long transmission line may be replaced by its equivalent Π or T line.[1] It is not so well known that any network between two points may be resolved into an equivalent Π, although in this case the Π may not be symmetrical, but may have different admittances at the two ends.[2] The whole circuit between the generator and the load, including both the line itself and the transformers at each end, may be replaced by an equivalent Π. The process consists of first replacing the line itself by its equivalent Π or T, and afterward making a number of Y-Δ and Δ-Y transformations. Symbols for the constants of the resulting equivalent Π may be obtained from Fig. 1.

Factors Affecting Adjustments to Give Best Operating Characteristics.—In determining the best setting for the regulators and the amount of synchronous reactor equipment which is to be installed at the load end of the line, there are four important factors to be considered. The ultimate aim is a minimum over-all annual cost, the various items of which are:

1. Fixed charges (interest, depreciation, taxes, etc.).
2. Value of energy lost in lines and machinery.
3. Operating costs (labor, supplies, etc.).
4. Loss (or gain) in good will due to the number of interruptions, quality of voltage regulation, etc. (In addition to the monetary value of what is technically termed good will is the moral and franchise obligation to furnish uninterrupted service.)

It is well first to go separately over the effect on the operation of the line of each of the four items listed above before undertaking the problem of the combined effect.

Items (1) and (3).—If only the fixed charges and the operating costs were considered, the best method of regulation would be to compound the generator voltage regulator enough to give good regulation at the load end. The expensive synchronous condenser equipment would thus be dispensed with, and this would probably

[1] Kennelly, "Hyperbolic Functions Applied to Electrical Engineering," Appendices D and E.
[2] Kennelly, "Dissymmetrical Electrical Conducting Networks," *Trans. A. I. E. E.*, Vol. 42, p. 112, 1923.

far outweigh the additional cost of extra insulation near the generator end of the line due to the rise of voltage there as the load becomes heavy.

Item (2).—If only the value of the energy lost in the transmission line and the transformers were considered, the best method of regulation would be to maintain the power factor of the current in the architrave of the equivalent Π line always at or very nearly at unity. This may be accomplished automatically by installing synchronous condensers and by compounding the generator voltage regulator. The algebraic sum of the reactive power taken by the load, the load-end pillar of the Π and the synchronous condenser must be zero to give unity power factor. When the losses in the synchronous condenser also are considered, the best power factor to be maintained on the architrave is somewhat less than unity, and lagging, if the load itself has a lagging power factor.

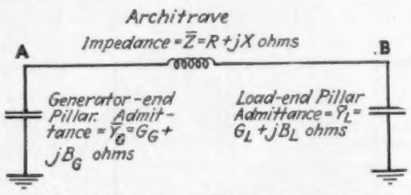

Architrave
Impedance = Z = R + jX ohms
A
B
Generator-end Pillar Admittance = Y_G = G_G + jB_G ohms
Load-end Pillar Admittance = Y_L = G_L + jB_L ohms

FIG. 1—EQUIVALENT Π OF TRANSMISSION LINE AND TRANSFORMERS

The electrical characteristics of this Π line between points *A* and *B* are identical with those of the actual line and connected transformers, in the steady state and at the normal frequency.

Item (4).—The effect of the fourth item is perhaps the most difficult to state categorically. Perfect, or zero, regulation may be obtained by the use of a synchronous condenser of adequate size, no matter what the degree of compounding of the generator voltage regulator may be. If the load consists principally of synchronous machines (motors and converters), there is some danger of their falling out of step in case of a momentary surge. The presence of a synchronous condenser of considerable size undoubtedly lessens the likelihood of the smaller loaded machines falling out of synchronism. However, if the synchronous condenser itself should fall out of step, the effect would be much more serious. On the other hand, if the load consists of asynchronous machines and lighting, the probability of interruption of service is greater with a synchronous condenser. The probability of a synchronous condenser falling out of step is dependent to a considerable extent on the amount of field excitation which it has at the time of the disturbance, and to a very large extent on the amount of connected load at the time of the surge. The problem of stability is one requiring careful study and consideration of existing installations, as well as a mathematical study of synchronizing power from the circuit constants.[2]

Water-Power Utilization in Russia

AMONG the hydro-electric development schemes at present in course of construction in Russia is a plant to utilize the power of the River Volchof to meet increasing current requirements in Leningrad (Petrograd). The station is about 70 miles from the city, and the work necessitates the building of a dam to raise the height of the river about 35 ft. A feature of the dam will be the provision of a lock 492 ft. in length by 65 ft. in width to permit the passage of vessels up to a draft of 7½ ft. Eventually, the capacity of the station is to be 54,000 kw.

[2]The question of stability of operation of long transmission lines was discussed at the A. I. E. E. midwinter convention in February, 1924, by Messrs. Doherty, Bush, Karapetoff, Moreland, Booth and others.

Transformer Inspections

Reducing Number of Burn-Outs—Details of Inspection Methods—Demand Determinations Made Yearly—Five-Year Results

INSPECTION and testing of distribution transformers by the People's Light Company of Davenport, Iowa, a subsidiary of the United Light & Power Company, during the past five years have proved to be very well worth while and have resulted in such a saving and been so valuable in preventing interruptions to service that the adoption of the practice throughout the system is only a question of time.

As a result of this practice, which was carried out under the supervision of C. R. Stahl, assistant general manager of the People's Light Company, the total number of transformers burned out each year was lowered from 5.57 per cent in 1919 to 0.88 per cent by the close of 1923.

The total connected transformer capacity burned out each year was lowered from 1.88 per cent in 1919 to 0.104 per cent by 1923. The expense of this five-year experiment was not large, amounting to about $1,000. Mr. Stahl estimates that, taking everything into consideration, equipment and time and minor details, the company effected a money saving of considerably over $5,000 without counting the decrease in interruptions, the loss of revenue that would have been incurred during such interruptions or the expense of taking down the burned-out transformers and installing new ones.

The method employed is a very simple routine of transformer inspection, test and record, one that could be installed to advantage where conditions are approximately the same as at Davenport, Mr. Stahl believes.

METHODS USED

Permanent records are kept of all distribution transformers. To each a company number is assigned when purchased and a history card is made up for it. The history card is filed in the distribution department and constitutes the permanent record of the transformer as far as the distribution department is concerned. Another permanent record is kept by the appraisal department as a part of the plant property record.

The history card, as the name implies, carries a complete history of the individual transformer from the time of its purchase until its final disposal. At the time of purchase the following information is entered on the history card:

Company number, manufacturer's serial number, manufacturer's name, type, form, cycles, phase, primary voltage, secondary voltage, percentage taps, rated capacity and date purchased.

Space is provided for entering the date and location of installation and the date of removal. Space is also provided for recording the results of inspections, tests and repairs. At the time of the final disposal of the transformer an entry is made on the history card showing final disposition—that is, whether it was sold or junked and the date of disposal. The cause of failure in case of junking is also entered; that is, if a transformer is burned out from overload by a secondary short circuit, by lightning or by poor oil, proper notation is made on the history card.

At the present time two annual inspections of all distribution transformers are made. The first of these is carried out during the months of February and

March, and its primary object is to see that all lightning arresters and grounds are in good condition before the lightning season starts. The second is carried out for the purpose of determining the loading of the transformer. All lighting-distribution transformer-load tests are made during the months of October, November and December.

Tests on power transformers depend on the condition of the industry which the transformers supply, the time chosen being the one when the transformers will receive the heaviest service.

In carrying out the first of these tests, lightning arrester and ground inspection, during February and March the principal items of inspection are the lightning arresters, grounds, transformer oil, cut-outs and fuses and a general inspection of the physical installation as a whole.

Mr. Stahl has found it most economical in making this inspection to have one man make the inspection and note all defective lightning arresters, cut-outs, etc., and follow this up with a crew to make the necessary repairs and replacements. During this inspection an examination of the oil level and the condition of the oil is made.

On small transformers the examination of the condition of the oil is merely a visual inspection to see that the oil level is at the proper height and that the lid and gasket of the transformer fit properly so that no moisture can get inside. On transformers of 100 kva. capacity and over, and on all transformers which operate from 13,000 volts primary, a sample of oil is taken from the bottom of the transformer either by draining from the plug in the transformer case or by taking oil from the bottom by means of a sampler.

This sample receives a voltage breakdown test to see that it is in good condition. If the test shows that the oil has deteriorated materially, the oil is replaced or filtered. Mr. Stahl has made tests of oil on small distribution transformers operating at 2,300 volts and 4,600 volts, but found that the expense of getting and testing them was not justified. An inspection of the cut-outs and entire installation is made, and repairs are then attended to wherever necessary.

The load tests made in October, November and December cover all lighting transformers. On all overhead construction the General Electric Type H2 demand meter is used to get the primary amperage of each transformer, and on the underground system a portable split current transformer and indicating ammeter is used to get the secondary amperes and to determine the balance of the three-wire system.

The use of the indicating ammeter and split current transformer necessitates the reading of load at the time of maximum demand on the transformer. In order to approximate this time, all readings are made on the underground system on Saturday nights, when virtually all downtown lights are being used. In using the General Electric Type H2 demand meter the instruments are mounted in wooden boxes and leads brought out to a 30-amp. porcelain cut-out plug so that to install the demand meter requires simply the removing of the regular cut-out plug and inserting the plug attached to the demand meter.

In carrying out this work one man is assigned to the inspection. This man is supplied with sufficient meters of proper sizes to make it possible to leave a demand meter in each installation from five to ten days, the time interval being in order to get the maximum indication. The inspector also makes a primary and secondary voltage survey of the entire lighting distribution system so that the necessary changes and extensions may be included in making up the next year's budget.

After five years of careful work on the distribution transformers Mr. Stahl and his assistants, by following out the plan given above, were able to show a marked decrease in the number of transformer burn-outs. In 1919 there were nineteen transformers with a rated capacity of 114 kva. burned out. In 1920, the first year after following this work up, thirteen transformers with a total capacity of 21 kva. were burned out. In 1921 three transformers with a total capacity of 18½ kva. were burned out. In 1922 three transformers with a total capacity of 13½ kva. were burned out, and in 1923 the results did not materially change.

Fig. 1 is a curve showing the per cent of kva. capacity of transformers burned out to the total kva. capacity of transformers connected to the system for those years. Fig. 2 shows the percentage of the number of transformers burned out to the total number of transformers connected to the system. These curves show a marked

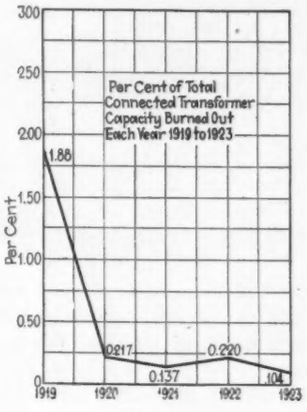


Fig. 1

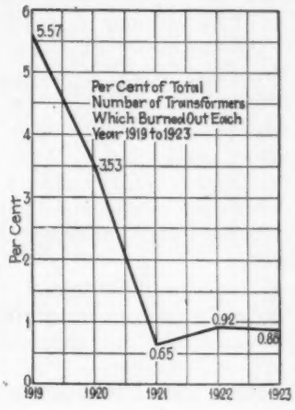


Fig. 2

TRANSFORMER FAILURES REDUCED

TRANSFORMER LOADING OF LIGHTING DISTRIBUTION SYSTEM

Circuit No.	Kva. Installed	Kva. Demand on Station	Ratio Col. 2 to Col. 1	Kva. Sum Individual Transformer Demands	Ratio Col. 4 to Col. 1	Ratio Col. 5 to Col. 3	Remarks
1	348	462	1.33	482	1.38	1.04	Underground circuit, business district only
2	430	576	1.34	601	1.40	1.045	Underground circuit, business district only
3*	475	440	0.926	445	0.937	1.01	Underground circuit, business district only
4	452	308	0.682	445	0.976	1.43	Underground circuit, business and residential districts
5	361	286	0.793	334	0.925	1.17	Overhead circuit, factory and residential
6	257.5	275	1.11	301	1.17	1.06	Overhead circuit, residential
7	355.5	297	0.835	398	1.12	1.34	Overhead circuit, residential and summer amusement park
8	257	319	1.25	342	1.33	1.07	Overhead circuit, residential
9	447.5	418	0.935	535	1.20	1.28	Overhead circuit, residential
10	386	356	0.922	400	1.04	1.13	Overhead circuit, residential
11	424.5	377	0.89	472	1.12	1.26	Overhead circuit, residential
Total..	4,194	4,114	0.98	4,755	1.13	1.15	

* This circuit is overtransformed at one office building with underground substation, 200 kva. installed, load 110 kva.

decrease in the number of transformer burn-outs as well as in the capacity of the transformers burned out in relation to the total capacity connected.

These results in transformer burn-outs have been obtained in the face of the fact that the company is operating lighting distribution transformers over their rated capacity as will be shown in the table, which gives the loading of lighting transformers as found during October, November and December of 1922. This table shows that the maximum station demand is 110 per cent of the total kva. capacity of transformers connected to the lighting distribution system and that the sum of the individual transformer loads is 114 per cent of the kva. capacity connected to the system.

In looking at the table it will be shown that circuits Nos. 1, 2, 3 and 4 show a higher maximum demand at the station than the sum of the maximum demands on individual transformers. The reason for this, Mr. Stahl points out, is that these four circuits constitute the underground lighting system and that the readings were taken by means of an indicating ammeter at a time when the maximum demand on the transformer did not occur.

The records obtained from the load tests are of immense value in designing the layouts of new circuits and rearranging the existing circuits to care for increased loadings. The People's Light Company now knows with a reasonable degree of accuracy the maximum amperage flowing in any feeder or branch line of a primary lighting circuit. The company is therefore able to calculate accurately the voltage drop in all sections of the primary circuit and determine the correct compensation for each circuit. The accuracy with which these voltage drops may be determined under maximum loading conditions has in a number of instances been proved by trial to be within 10 volts or approximately one-half of 1 per cent.

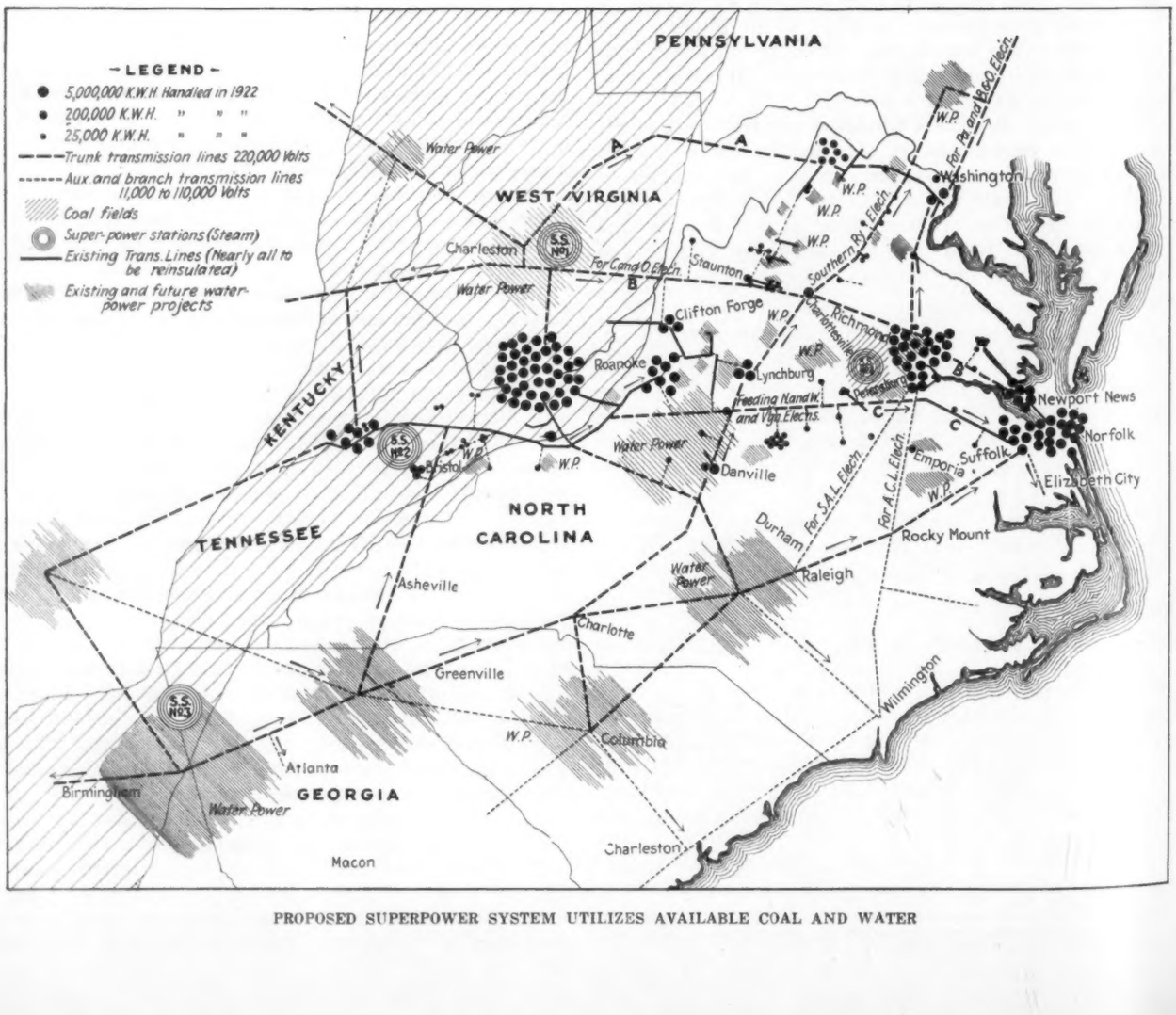
Superpower Network Proposed for Southeast

Maximum Utilization of Water and Fuel Resources Planned—Developments to Secure Economic Results in the Future Outlined

BY EDWIN WORTHAM
Consulting Engineer, Richmond, Va.

A NATIONAL movement has been created to secure a more adequate power supply and to use water and fuel most economically in power production. This movement has been reflected in various localities in greater or less degree and the accompanying map shows the result of studies of the power situation in Virginia and adjoining states.

The plan developed for this region calls for the utilization of existing water-power possibilities that



PROPOSED SUPERPOWER SYSTEM UTILIZES AVAILABLE COAL AND WATER

can be developed economically in combination with large and economical steam stations—all interconnected by trunk transmission lines operating at 220,000 volts. Auxiliary and branch lines will be operated at voltages ranging from 11,000 to 110,000, depending on location and load conditions.

Four major steam stations are proposed at the locations indicated on the map—one in the heart of the coal fields near Charleston, W. Va.; another near Bristol, Va.; a third which would constitute an auxiliary steam station for the network between Birmingham and Muscle Shoals, and a fourth at Richmond, Va. In addition to the four major steam stations, ten large hydroelectric stations will be utilized at advantageous and strategic locations as indicated on the map. These plants would take the place of the ninety-three small and generally uneconomical plants now found in the district.

The plan calls for the utilization of existing transmission systems and ties in readily with proposed superpower networks in adjacent territory. It also affords opportunity for power interchanges between adjacent regions. Existing plants would be operated until the end of their economic life, but no replacements or additions would be made. The investment in new plants and lines can be made gradually, although if installed completely the estimated yearly savings over present operating conditions would pay for the installation in ten or twelve years.

The plan is made on a big, broad basis which involves railroad electrification and industrial and domestic use of power on a big scale, because it is felt the developments of the future call for this kind of planning if mistakes are to be avoided. No definite commercial steps have been taken to institute the whole scheme, but the study shows the possibilities.

Æsop's Fables Carry Message to the Public

How the Oklahoma Gas & Electric Company by This Expedient Interested Both the Young and the Mature Generation—Modern Interpretation of the Tales and Their Application to Utility Companies

NEWSPAPER advertising and other forms of publicity are of little avail in establishing permanently friendly relations if they are unbacked by service in its broadest sense and by the proper attitude of utility executives and employees toward the public. However, when these primary essentials of good public relations are existent, properly prepared publicity is very helpful in dispelling some of the misconceptions regarding utilities which have become rooted in the public mind. Various forms of publicity have been tried and have brought results differing in degree of effectiveness. Æsop's fables, possibly because they have endured so many centuries and are still read with interest, have, when combined with a twentieth-century interpretation and application to public utilities, been particularly effective in educational advertising.

METHODS USED IN OKLAHOMA

In Oklahoma this method of removing misunderstandings was employed by the Oklahoma Gas & Electric Company, which operates in Oklahoma City, Muskogee, El Reno, Enid, Sapulpa, Norman, Yukon, Hennessey, Waukomis, Kiefer, Fort Gibson, Drumright and surrounding territory. A series of twenty illustrated fables with their modern interpretation and application to the utility business was run in the leading newspapers, one story a week. Where there were both a morning and an evening paper two half-page insertions were run in each paper every week—on Sunday and Wednesday in the morning paper and on Tuesday and Saturday in the evening paper.

To obtain the most far-reaching effect from these advertisements half-page announcements were run in each paper during the week prior to the Æsop series featuring the fact that "Some boy or girl, sixteen years of age or under and attending school, is going to be awarded $100 and three others will receive $75, $50 and $25 for the best essay on 'What I have Learned from the Æsop Fable Stories.' " Contestants were advised to cut out and preserve each advertisement and prepare an essay, not to exceed 500 words, on what was learned from the series. Four judges were selected from prominent citizens in the community served, including such persons as the presidents of the local chambers of commerce, pastors of churches and editors of newspapers. These four selected a fifth judge. The identity of the contestants was concealed during the judgment of essays, which were "weighted" according to the following plan: Ideas, 60 per cent; composition and rhetoric, 30 per cent; neatness and arrangement, 10 per cent.

By enlisting the interest of children and thus inducing them to talk about the series at home, the Oklahoma Gas & Electric Company was able to bring the facts before the adults more forcibly than it would have been able to do if the appeal had been made to the latter only. Furthermore, by having the children prepare essays on the subject the points brought out in the advertisements were more permanently impressed on the young minds than they would have been by one reading. This was considered very important since the children of today are the adults of tomorrow and even as children have no little influence in molding opinion.

PRIZE ESSAYS PUBLISHED

Additional attention was called to the lessons brought out in the advertisements by giving publicity to the prize essays. This was done with hardly any expense because schools and newspapers were glad to circulate the efforts of the winning students.

Other companies may benefit by similar methods. Some companies which have employed such advertisements have purchased the cuts to be used as well as the wording from a firm which has copyrighted its particular method of presenting the Æsop series. The

cost by this method is naturally less than where special drawings and cuts are prepared.

While good illustrations attract more attention to these advertisements than would unadorned text, any one will readily agree that the modern interpretation and application of the fables to public utility relations are the essential features after attention has once been attracted. Some of the interpretations that have been appended to the fables by the Oklahoma Gas & Electric Company follow:

Twentieth Century Versions of Æsop's Fables

The Three Blind Men

THREE Blind Men, approaching the Keeper of the Rajah's Elephant, requested that they be allowed to feel the Beast.

"We have heard many conflicting stories concerning the Elephant," said they, "and we wish to determine for ourselves just what sort of an animal it is."

The first, being allowed to touch the Elephant, laid hold of its tail.

"Why, the Elephant is like a rope," he cried.

The second, approaching, placed his hand on the Elephant's side and at once cried out:

"No, the Elephant is like a wall."

The third, taking his turn, touched the trunk of the Elephant and said to his fellows:

"You are both wrong. The Elephant is like the trunk of a tree."

Three separate opinions—and all three wrong.

This story illustrates a trait of human nature—the trait of getting wrong notions about things.

Nowhere is this so true as in the Public's relations with the Public Utilities (and particularly the electric and gas company).

Are you sure *YOU* have judged the electric company rightly? Have you investigated its problems, observed the scope of its services, and have you noticed its place in this community and in this state?

If you have not, then are your ideas or opinions correct? The Oklahoma Gas & Electric Company invites you too look beneath the surface of its service at its problems and then form your own opinions. Your sense of fair play will induce you to take a greater interest in our company and to lend your support in its task of furnishing a valuable and necessary service to this city.

The Dog in the Manger

A DOG was lying in a manger full of hay. He was ordinarily a good-natured pup, playing with the children or passing automobiles all day long, but when a Horse, hungry from his hard day's labor in the fields, came in and began to eat the hay the Dog leaped up and, with loud barks, drove him away.

In his disappointment the Horse exclaimed: "It's a thoughtless sport who won't let another have what he can't use himself."

There's a lesson in the episode of the dog in the manger.

How often do we see one or two "dogs in the manger" who hold back the development of a whole community because of their mistaken or unwise attacks on the vital institutions of that community, such as an organization furnishing electric light and power!

These men are nearly always kindly, generous men in every other respect. They go to church on Sunday and play with their children on weekdays. They pay their bills regularly and are respected in the community.

The Miller and his Mule—
Aesop tells the story of a Miller
As he and his son walked beside th
about what fools they were for trud
as well be riding. Accordingly, the
the Mule's back.
No sooner was he up th.e a gr
"That's jest the way with thes
young fellers, by heck! That lazy
ting his poor old Paw walk."
The Miller saw it that way, t
while he rode.
A club meeting was in full sess
The OLD MAN and the STICKS
s story of the Old Man with the quarreling
rs do them that this was sure to end in dis-
th he decided to try something else.
cks, he made them into a tight bundle, and
m to try and break the bundle. In vain they
tempts—not one of them could break it.
perform the feat, the Old Man at length took
a small stick to see if he could break that.
ey said as each snapped with ease the twig
s, I wanted to show you how much more
The DOG in the MANGER
A Dog was lying in a manger full of hay. He was ordinarily a good natured
pup, playing with the children or passing automobiles all day long, but when
a horse, hungry from his hard day's labor in the fields, came in and began to
development of Muskogee and insisting that it continue to function now and
in years to come as an important element in the success of your business and
the happiness of your home? Think it over, Mr. Business Man.
OKLAHOMA GAS AND ELECTRIC COMPANY
EASTERN DIVISION, GEO. E. WILMARTH MGR.
Personal Attention to Every Customer
No. 10

TYPICAL NEWSPAPER ADVERTISEMENTS OF AESOP'S FABLES

But when they take an attitude of misunderstanding and unfairness toward an industry such as ours, no matter how well meaning, they are really a big drawback to that community.

Every sane person knows that without efficient electric light and power service factories, business houses and homes will not spring up in this city. Knowing this, why not treat with businesslike fairness the institutions which mean so much to the community?

Are you as well informed as you might and could be on the subject of your electric service company? Are you giving thought to this vital factor in the development of Muskogee and insisting that it continue to function now and in years to come as an important element in the success of your business and the happiness of your home? Think it over, Mr. Business Man.

The Old Man and the Sticks

OF COURSE you have heard Æsop's story of the Old Man with the quarreling sons. Time after time he had tried to persuade them that this was sure to end in disaster for them, but to no avail. At length he decided to try something else.

Gathering a quantity of small sticks, he made them into a tight bundle, and then handed it to his sons, telling them to try to break the bundle. In vain they strained, one after another, in their attempts—not one of them could break it.

Seeing that they were unable to perform the feat, the Old Man at length took the bundle to pieces and gave each son a small stick to see if he could break that.

"Why, that's child's play," they said as each snapped with ease the twig handed to him.

Then the Old Man said: "My sons, I wanted to show you how much more powerful you would be if you would stick together like brothers instead of wrangling like beasts."

So thoroughly did the Ancients understand the truth of the old phrase "In union there is strength" that the Fasces — a bundle of sticks bound together—was the official symbol of the Roman Empire.

What the Ancients discovered remains true today.

"Blood brothers" cannot fight or quarrel among themselves without bringing to themselves sure and swift disaster.

So closely interwoven into the business and home life of the community is the electric light and power company that the Community and Company are nothing more nor less than "blood brothers."

The great and powerful enemy to these two "blood brothers" is Hard Times. If they would bring prosperity into partnership and kick hard times out the back door, these two—the community and the light and power company—must stand together as brothers should.

No community is any bigger or better than its electric system.

No electric system can develop any bigger or better than the community.

In a word, then, the Community and the Company are dependent upon each other for prosperity. Like the boys of the fable, they must both know that co-operation brings success.

The Blind Man and the Lame Man

YOU'VE heard the old story of the Blind Man and the Lame Man. One couldn't see to walk and the other couldn't walk to see. Said the Blind Man to the Lame Man: "Guide me through the swamp."

"How can I do that," replied the Lame Man, "when I can scarcely drag myself along? But you seem to be very strong, so why not carry me and we will seek our fortunes together. I will be eyes for you, and you can be feet for me."

"With all my heart," said the Blind Man. "Let us be of service to each other," and having put his lame companion on his back, they traveled in safety and pleasure.

Now let us make a direct application —or moral—of this familiar fable.

The Community is the Blind Man in the swamp, feeling its way and hoping to find prosperity.

Your Electric Light and Power Company is the Lame Man because of its need for funds and public confidence to make improvements and betterments to service, as well as for the construction of economically large power plants developing lines to serve Muskogee's section of the state and her trade territory. Your community can develop electrically just to the extent that it is possible to develop great electric systems, of which this city is the hub.

We must realize—and you, the general public of Muskogee, must realize —that helpful happiness can only come by perfect co-operation between the two.

We must understand your problems and be able and ready to assist you in solving them.

You must understand our problems —it is to your selfish interest to do so—and must help and assist us in solving them.

We cannot continue to invest great sums of money for the perfection and adequacy of the service we must at all times stand ready to furnish unless your good will assist us.

And so, in the final analysis, it comes back to each individual citizen in this community.

Continual development of this great industry will go on if, on your part, there is an understanding of our problems and a friendly attitude which will naturally follow understanding.

It is the same old story. Co-operation gets results for each. Pulling against each other brings disaster to both.

In the words of the Blind Man, "Let's be of service to each other."

The Miller and His Mule

A STORY is told by Æsop of a Miller who was taking a Mule to sell. As he and his son walked beside the animal a girl said something about what fools they were for trudging on foot when they might as well be riding. Accordingly, the Miller told his Son to get on the Mule's back.

No sooner was he up than a group of old men called out:

"That's jest the way with these worthless modern day young fellers! That lazy young rascal is riding and letting his poor old Paw walk."

The Miller saw it that way, too, and made his son get off, while he rode.

A club meeting was in full session as they passed. One of the women called the attention of her sisters.

"Ain't it a shame!" they all chattered together, "that awful Old Man makes the poor little Boy walk while he rides at ease."

The Miller then directed his son to get up behind him. They had progressed only a block when the Butcher yelled after them:

"Hey, Old Man! Is that your Mule? Guess not, though, or you wouldn't load him like that. You are better able to carry him."

"Anything to please," said the Miller, dismounting, and they tied the animal's legs together and, running a stick through, they tried to carry him on their shoulders.

At this sight the people screamed with laughter, and the Mule, who was a self-respecting animal, was so enraged at the ridiculous position he was in that he kicked loose his bonds and disappeared down the road in a cloud of dust.

Your electric service company sometimes finds it about as difficult to meet all of the demands made on it as did the Miller. Individuals and collections of persons all believe something different is best, and the State and Cities do not always agree on their restrictions.

It is a matter of pride with us that we meet all these demands with as prompt cheerfulness as is humanly possible. But in order to meet them we must secure money—money which can be furnished only by the investors, who are largely influenced in their judgment of us by what the people think of us in this community. Don't wreck their good opinion by misunderstandings or unjust criticism.

The electric development afforded this city is one of its greatest single assets.

Letters from Our Readers

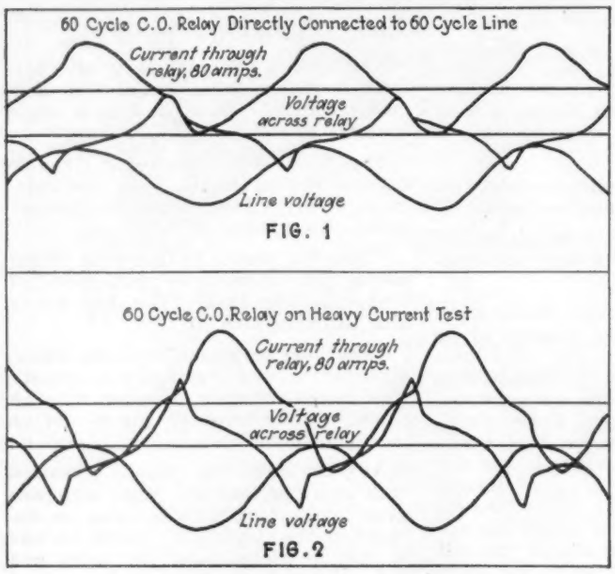
A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute

Testing Saturated Core-Type Relays

To the Editors of the ELECTRICAL WORLD:

Referring to the comments of R. G. Warner in the June 28 issue of the ELECTRICAL WORLD, I would suggest that the difference in testing a saturated-core type of relay on a phantom or a resistance load lies in the fact that a phantom load will tend to keep a sine voltage across the relay terminal, allowing the current to distort and fulfill the instantaneous requirements imposed by the saturating iron, while a resistance load tends to produce a sine current in the relay and allows the relay terminal voltage to distort sufficiently to fulfill instantaneous requirements.

The latter condition is that which usually prevails in actual operating service as the current in the secondary of a good current transformer approximates the wave


60 Cycle C.O. Relay Directly Connected to 60 Cycle Line
Current through relay, 80 amps.
Voltage across relay
Line voltage
FIG. 1
60 Cycle C.O. Relay on Heavy Current Test
Current through relay, 80 amps.
Voltage across relay
Line voltage
FIG. 2

EFFECT OF LOADING IN RELAYS

Fig. 1—A resistance load gives a line voltage across the relay terminals.
Fig. 2 — The effect of a phantom load under the same test conditions.

form of the primary current (before the ratio breaks down badly), and this current even during a severe "short" is usually like the generator voltage wave. The voltage on the secondary of the current transformer, however, may be badly distorted in order to satisfy the demands of the magnetic circuit of the relay.

But there should be little trouble encountered if a correctly designed phantom-load transformer be used with resistance in the secondary instead of the primary. The oscillogram in Fig. 1 shows a sine voltage, together with the current in a relay and 110-volt resistance load, and the voltage across the relay terminals. Fig. 2 shows the same values when the relay is connected to a phantom load at 25 volts. These curves were taken with a Westinghouse portable oscillograph.

Extreme caution should be exercised in avoiding saturated or overloaded phantom-load transformers as both waves may be badly distorted and produce very erroneous results. In one severe case noted an error of 100 per cent was found due to such a transformer. In other words, a relay set for two seconds on the phantom load actually tripped in one second under actual load, and relays thus calibrated could completely upset the finest sectionalizing system.

The errors introduced may not be due to the relays alone, but many ammeters on the market are in great error on distorted waves and also introduce errors in the relay calibration.

VICTOR H. TODD.
Summit, N. J.

Will Central-Station Output Reach "Saturation Point" in Next Decade?

To the Editors of the ELECTRICAL WORLD:

There are several features of the recently issued report of the Northeastern superpower committee (abstracted in the ELECTRICAL WORLD, August 2, 1924, page 205) which leave the reader very much in the dark and which, it is to be hoped, will be cleared up in subsequent reports.

In the study no mention at all is made of the importation of Canadian power into the Northeastern area. Last year this stood at 1,400,000,000 kw.-hr. This is an increase of more than 30 per cent over the previous year, and, if the present activities of hydroelectric development in Ontario and Quebec are any indication, its future tendencies are worthy of the most serious consideration.

The study appears to be built up on a predicted use of electrical energy which is described in the report as follows: "A study of the growth of electrical power application shows that it has compounded for the last few years at the rate of 10 per cent per annum. An approximation of the future demand, not including possible electrification of railways, indicates that the total electrical power demand in 1930 will be 30,800,000,000 kw.-hr."

This, on its face, is an appalling contradiction. Ten per cent annual increase on 21,100,000,000 kw.-hr., which is stated as the amount of power used in 1922, would bring the total up to 45,300,000,000 kw.-hr. in 1930, instead of 30,800,000,000 kw.-hr. Even taking out the power apparently generated by manufacturing interests for their own purposes and using the figures published by the Geological Survey of 17,500,000,000 kw.-hr. in 1922 for the electricity made exclusively by public utilities, a 10 per cent annual increase would bring the total to 37,600,000,000 kw.-hr. in 1930.

Why, if the statement is made of a 10 per cent annual increase in the past, is the future predicted by the use of a diminishing series which involves, apparently, only a 4 per cent growth by 1930?

Is it really true that the curve of industrial activity —as measured by power used (not power installed)— is flattening out? Will central-station output reach the "saturation point," or parallelism with population, within the next decade, as the figure of 30,800,000,000 kw.-hr. would appear to imply? If this is so, then it is to be hoped that it will be clearly proved in some later report, because this, if correct, is by far the most important part of the entire study. These points need elucidation before the report is complete.

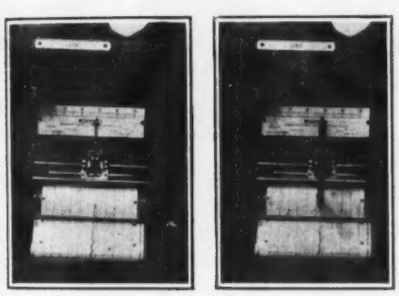
W. M. CARPENTER,
Engineer.
Empire State Gas and Electric Association,
New York, N. Y.

Central Station and Industrial Practice

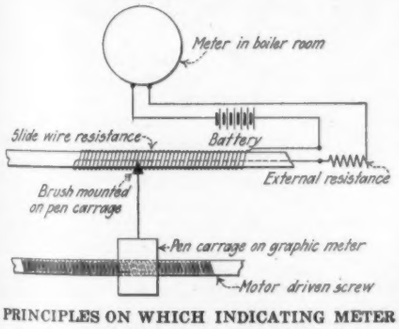
Indicating Generator Load in Boiler Room

By R. L. Frisby
Electrical Engineer of Stations Kansas City (Mo.) Power & Light Company

TO KEEP boiler-room operators advised of station loads, the Kansas City Power & Light Company has erected a large kilowatt-indicating instrument at the end of the firing aisle in the Northeast station. While it registers total load in kilowatts, it is merely a direct-current milliammeter having a 36-in. dial and is actuated by the current allowed to pass through it by a pair of contacts mounted on the pen carriage of the totalizing graphic wattmeter in the switch gallery.



BRUSH ON PEN CARRIAGE BEARS ON RESISTANCE TUBE CONTROLLING INDICATING INSTRUMENT



PRINCIPLES ON WHICH INDICATING METER IS ACTUATED FROM TOTALIZING GRAPHIC METERS

When the question first arose of keeping the boiler-room operators posted as to the operating conditions in the turbine room, an investigation uncovered the fact that such a system, if purchased commercially, would involve more expense than was warranted at that time. Further study, however, disclosed an arrangement which finally installed would cost only $300, including the indicating instruments ($250), labor and auxiliary equipment. Besides the indicating instrument, a resistance bar had to be inserted in the graphic wattmeter with movable contacts actuated by the pen carriage and circuits had to be run from the switch gallery to the boiler room. Furthermore, the indicating instrument had to be calibrated in terms of kilowatts.

The operating principle of this boiler-room indicating instrument is to measure the voltage drop across resistance as varied by the travel of the pen carriage of the graphic wattmeter. This resistance bar consists of a ½-in. rubber rod on which is wound No. 28 german-silver wire. It is mounted in the base of the wattmeter so that an aluminum and copper brush on the pen mounting makes good contact. Energy is provided from an 8-volt storage battery.

Transformers Being Built with Tap Switches

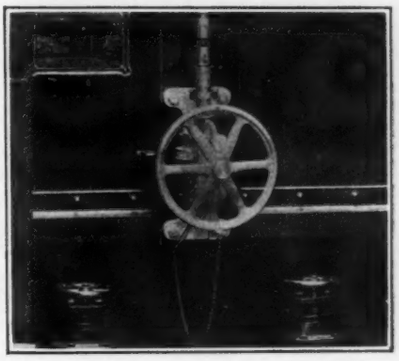
By A. Palme
Transformer Engineering Department, General Electric Company, Pittsfield, Mass.

IT IS usually necessary to provide large transformers with more than one voltage transformation ratio. For example, a transformer for stepping down the voltage from 66,000 to 2,300 is commonly provided with four 2½ per cent taps below normal in the high-voltage winding to take care of variations in the line voltage. These additional taps are brought up to an oil-immersed terminal board, on which with suitable links or jumpers any one of the available voltage ratios can be adjusted. On large transformers the terminal board is placed near the oil level so that after removing a manhole cover on the top of the transformer the terminals can be reached easily.

A decided advance was made with the introduction of the ratio adjuster, a small, multi-contact switch, installed near the transformer winding, with an operating handle reaching a little above the normal oil level of the transformer. With such a switch it is possible to change the transformation ratio with a fraction of a turn of the handle, without reaching into the oil.

A step further was the bringing out of the operating handle of the adjuster, oil-tight, through the cover of the transformer, which does away with the necessity of even opening a manhole cover.

On transformers of large output installed in high tanks the operation of the handle to change the ratio means the use of a ladder to climb on top of the transformer. This is inconvenient in all cases where the ratio has to be changed frequently. There has now been designed for this purpose a gear drive by means of which one or several ratio adjusters in one transformer may be set conveniently from the ground by turning a handwheel attached to the side of the transformer, as shown in the accompanying illustration. This is a three-phase, 60-cycle, self-cooled transformer of 12,000-kva. output, with a ratio of 69,300 volts to 11,000 volts, equipped with five taps in each of the three phases, so that voltages of 59,400, 62,700, 66,000, 67,700 and 69,300 can be obtained.



MECHANISM FOR CHANGING VOLTAGE TAPS IN LARGE TRANSFORMERS

By means of very accurately adjustable couplings between the ratio switches and their connecting shaft the three adjusters were aligned easily so as to snap from one position to the next simultaneously. In order to reduce the power required to go from one tap to the next a gear ratio of one to three was introduced between the common shaft and the operating handwheel.

The three vertical shafts from the

adjusters are driven by one-to-one bevel gears from a common horizontal shaft mounted in three bearings directly over the core yoke. By means of suitable bevel gears the driving shaft is carried through the cover and down along the outside of the tank wall into the operating gear box.

As each of the five possible steps represents a turn of 60 deg. on the adjuster and a one-to-three gear ratio is installed in the operating box, one-half turn of the handwheel is required to change the transformation ratio one step. Special universal joints are placed in the shafting to take care of small variations in alignment. To avoid unauthorized turning of the handwheel, a locking device is installed on the wheel where it is mounted on the case.

A further feature of the drive is an electrical signaling apparatus attached to the main vertical shaft. This device closes a circuit whenever the adjusters are off position, the circuit being opened again when the switches are exactly on a tap. An alarm bell or red light may be operated from this safety device, which indicates to the operator when the switch is not exactly on a tap. A pointer on a circular indicating disk shows at a glance on which tap the transformer operates at any time. The device can be locked only on a tap position. It is not intended for operation under load and it is necessary to open the main circuit breaker before changing taps.

Overhead Distribution Construction

Standardized Practice as Developed and Used by the
WEST PENN POWER COMPANY, PITTSBURGH

Distribution Estimates

The following specifications shall be used in making up estimates for local work orders involving small extensions to the distribution system. They should also be used as a guide in making up estimates for all work orders. In rare cases local conditions or other special features may make special design desirable, but, in general, no departure from these specifications should be made without the prior approval of the distribution engineer. All new work must be in accordance with specifications as outlined in previous articles of this series.

Estimates. — Work order estimates shall be made on standard estimate forms and shall give complete information as to the work proposed. The title should be short, but such as to permit of accurate reference to the estimate. The description should consist of a brief but complete statement of the exact work to be performed and changes to be made and also the reasons why such work or changes are necessary or desirable. Special mention shall be made of any public utility crossings proposed or other work which will require right-of-way procedure. Reference should be made to any other estimates for work to be done in connection with that covered by the estimate and to any credit estimate, in the latter case giving the date of original installation.

Estimates for new customer's installations shall give, in addition to the exact name of the proposed customer, detailed description of the load to be added, with nameplate ratings of machines, etc., together with any information available as to future business or desirability of making such installations.

Estimates shall include an itemized list of the material necessary to do the work proposed. Costs shall be inserted (including the estimated labor and drayage), which, as well as the general layout and design, may be changed by the distribution engineer. Estimated costs of right-of-way and engineering may be changed by the departments interested.

An allowance of 10 per cent or less may be made to cover incidentals, variation in prices, breakage and contingencies which cannot be foreseen when the estimate is prepared. Charges should be segregated according to standard classification of accounts, but the recapitulation by accounts will be made by the work order department, which department will also make all additions to estimates to provide for general overhead and interest during construction.

Credit work order estimates covering replaced or salvaged equipment shall show the original date of installation on the face of the estimate. If the exact date is not known or obtainable, it should be estimated, and it shall always be ascertained whether it is after or prior to January 1, 1919. The credit estimate shall give an itemized inventory and per cent condition of the equipment to be removed. The original cost of installation, including labor and drayage, shall be given as accurately as possible. Salvage values and any pertinent notes as to the general condition of the equipment shall be given for the guidance of the stores department, which will set the actual prices at which salvaged material is to be returned to stock and credited. The cost of removal from service and preparation of salvaged material shall be charged to maintenance accounts and the estimated amount necessary for such work shall be shown on the estimates. In addition to the above information, credit work order estimates involving the abandonment of a customer's connection shall show the "on report" date and "off report" date of customer's connection and contain a statement as to the possibility of any future business at the abandoned location.

As far as possible estimates shall be complete in themselves and the number of inclosures should be held to a minimum. In general, however, inclosures and information other than that appearing on the estimate are necessary in the following cases:

(a) All estimates for foreign orders shall have attached to them a letter or other form authorizing the company to bill the foreign company for all work done by the former for the latter company and specifying the exact terms and method of billing.

(b) All estimates for additions, removals or other changes to streetlight circuits shall have attached to them proper authorization from the city, borough or county authorities for the work to be done, including exact location of all lamps affected.

(c) In some cases estimates, especially for temporary work, may require explanation other than that which it is possible to give on the estimate form. Any pertinent information necessary for action by the various divisions or departments of the company shall be forwarded with the estimate, even if a letter is necessary in addition to the estimate form.

All estimates should show the estimated date of completion of the work but such date will be subject to approval by the right-of-way and engineering departments on estimates requiring procedure by those departments and by the superintendent of distribution construction if the work is to be done under his supervision.

Work orders will be made from completed estimates by the work order department, which will obtain all necessary approvals. All work should be in strict accordance with the work order as approved unless unforeseen contingencies make other construction absolutely necessary. The work order "Closing Notice" should explain in detail any deviations in either work or charges from those that have been authorized by the approved work order.

Altitude Correction for Temperature Rise

THE problem of determining the effect of altitude in increasing the temperature rise of electrical apparatus was presented in a paper by R. E. Doherty and E. S. Carter before the annual convention of the A. I. E. E. in Chicago. The authors showed that heat is dissipated from the various surfaces of the apparatus, principally by convection and radiation. The former is a function both of temperature rise and of air density—that is, of altitude—while the latter is a function of temperature rise only. The energy

CALCULATED PER CENT CORRECTION IN TEMPERATURE RISE FOR EACH 1,000 M. ALTITUDE

Apparatus	Element	Per Cent Temperature Correction* per 1,000 M. As Applied to Surface Temperature Rise	As applied to Copper Temperature Rise
Turbine generators (inclosed ventilation)	Armature coil	10.7	6.25
	Field (rotor)	11.0	7.15
Inclosed-type generator and motor			
(a) Inclosed ventilation	Armature coil	10.7	6.25
	Field coil:		
	Insulated	10.7	7.75
	Bare copper strip	10.7	10.7
(b) Open-type (generators and motors)	Armature coil	9.0	6.5
	Field coil:		
	Insulated	9.0	6.5
	Bare cu. strip	9.0	9.0
Totally inclosed motors; no ventilation	Armature or field	5.35	4.6
Transformers:	Tank surface		
(a) Water-cooled		0	0
(b) Air-blast†		11.2	11.2
(c) Natural-draft†		4.6	4.6
(d) Oil-immersed, self-cooled			
(1) Plain tank		2.2	1.6
(2) Corrugated, tubular or radiator tank		4.2	3.06
Reactors and busbars		4.7	4.7
Rheostats, meters, relays and miscellaneous stationary apparatus		4.2	4.2

* The difference between these columns is due to the different percentage base—surface rise in one, copper rise in the other.
†Hot-spot surface temperature may be as high as the average copper temperature as measured by resistance.

loss in the apparatus—that is, the heat to be dissipated—is not changed significantly by altitude. Thus, lower air density at higher altitude means decreased convection. Hence higher temperature, which increases both convection and radiation, is required to carry off the same heat. Specifically, then, the problem is to relate these several factors so that quantitative calculations can be made for various types of apparatus.

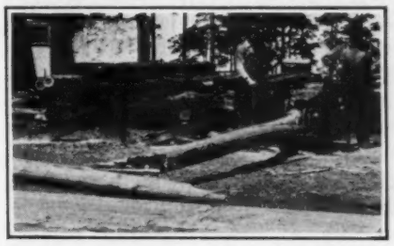
An investigation was made in 1921 to determine how dissipation by convection varies with temperature, air density and also with respect to the air movement—i.e., whether it is a blast or merely the natural movement created by temperature difference: in other words, whether it is "forced" or "free" convection. The results check reasonably with those obtained by other investigators.

The tested apparatus, consisting of electrically heated plates, was inclosed in a large wooden tank or drum in which the air pressure could be controlled. The constants from these tests were used in setting up equations which give the increase in temperature rise occasioned by lower air pressure for free and forced convection respectively. Reasonable assumptions simplify these equations for practical calculations for various kinds of apparatus.

To study altitude effect on actual rotating apparatus a 7½-kva. synchronous motor was tested in the drum at various air pressures. The actual increase in temperature rise agrees well with the values calculated by these equations. Tests were also made on a 2,550-hp. high-speed synchronous motor, first at Lynn, Mass. (sea level), and later at Cerro de Pasco, South America, at an altitude of 3,700 m. These tests afforded an opportunity to check calculations against actual data on rotating apparatus. The accompanying table gives the increase in temperature rise.

Testing Wooden Poles by Dynamometer

FROM the standpoint of reliability of service, it is necessary that all wooden poles used by a utility company be strong enough to stand up under severe gales when the lines are loaded with sleet, this representing the worst strain that is imposed on poles. However, from the standpoint of economy, it is desirable that the poles shall not run to such large

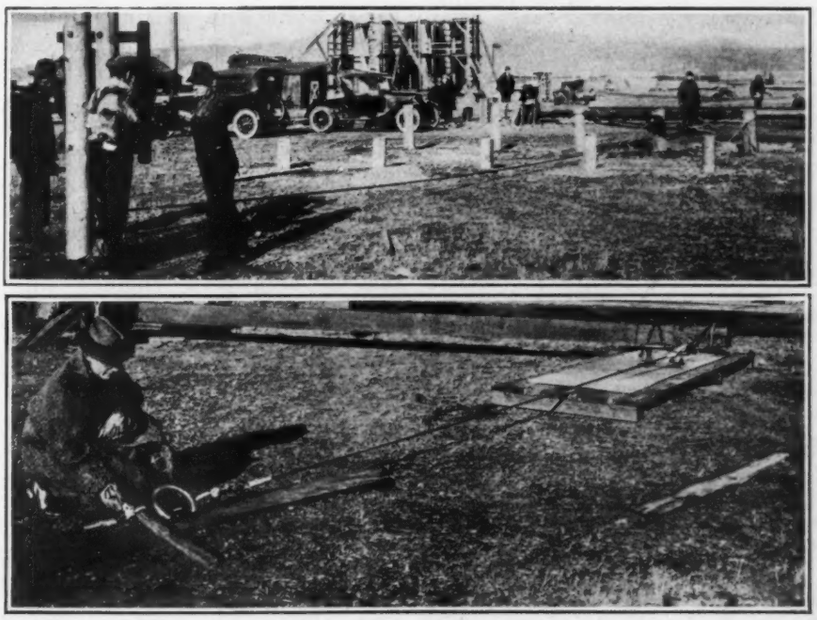


DOUBLE BREAK CHARACTERISTIC OF MANY POLES

sizes that the girth is much in excess of what is needed to meet service conditions.

To choose successfully the proper sizes of different species of wooden poles requires knowledge of the modulus of rupture in bending, or, as it is frequently termed, the fiber strength. An approximate idea of the fiber strength can be obtained by the use of the published tables which are based on tests of small clear specimens of wood. A more reliable and accurate figure can, however, be obtained by directly testing a sufficient number of full-sized poles.

A general layout for testing is shown in one of the accompanying illustrations. The butt end of the pole is securely fastened and the load is gradually applied by means of a hand or power winch. In the case of the layout shown several lengths of poles were to be tested so

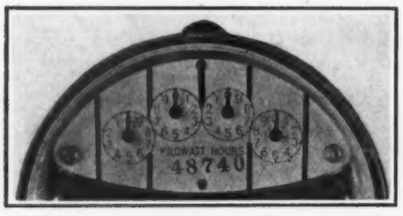


ARRANGEMENTS AND RESULTS OF TESTING WOODEN POLES FOR BENDING STRESS

that an intermediate arrangement of snubbing posts, with accessory blocks and tackle, was used to facilitate the application of load in a direction which would be approximately perpendicular to the axis of the pole, since in all cases the pull on the pole had to be applied at a point near the top. Another illustration shows in the foreground a Chatillon dynamometer which was the means of determining the loads sustained during the tests. A platform faced with sheet metal was also placed under the top of the pole, forming a smooth-running surface for a four-wheeled buggy, the support of which is necessary in order to insure the elimination of any downward component of load due to the weight of the pole. Deflection at the point of load was measured by means of a tape, one end of which was attached to the pole at the top. The tape was held against a reference stake and its movement noted at suitable increments of load. The third illustration shows a pole broken in test. This pole is Southern white cedar, or juniper as it is variously termed, and the double break is characteristic for tests of this timber and also of Eastern cedar. Less brittle timber will fail without breaking in two.

Warning of Meter Constant

THROUGH the oversight of the meter readers or failure of the meter installers to indicate if a multiplying factor must be applied to the meter readings, utilities sometimes find that the meter readings are improperly recorded. As a result the customer is billed for less than



STRIPES ON METER DIAL INDICATE THAT A MULTIPLYING FACTOR MUST BE APPLIED

he owes, and even if the error is detected, considerable explaining may be necessary to recover the unbilled amount. Meanwhile the utility company is without the use of the money, and it is usually unable to collect the interest.

To reduce the possibility of such occurrences, the Dallas (Tex.) Power & Light Company paints parallel red stripes across the face of the dial to attract attention to the fact that a constant must be applied to the reading. Meter readers are paid a bonus for all meters found striped for which the regular reading slip does not show a constant and for meters they find with a constant and the dial not striped.

Burning Heavy Fuel Oil in Diesel Engines

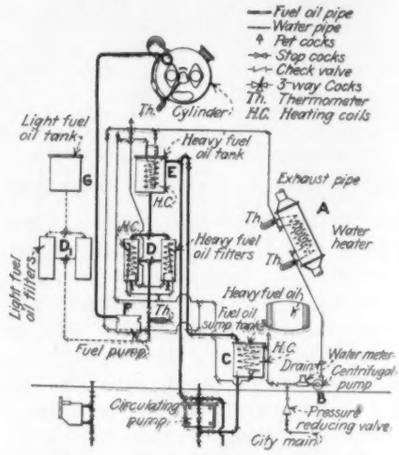
BY REINHARD HILDEBRAND
Chief Engineer Diesel Division, Fulton Iron Works Company, St. Louis

IN CERTAIN sections it is very important that Diesel engines should burn heavy fuel oil of a grade similar to that of Mexican and bunker oils because in these localities lighter fuel oils are often difficult to obtain and cost several times as much as the heavy oils more readily available. One method now being employed in solving the problem of how to use this fuel is given below.

Heavy oils containing a high percentage of carbon and a low percentage of hydrogen have a high specific gravity corresponding to a low degree of Baumé, a high viscosity, a high sulphur content and their flash point is low, requiring a higher temperature for ignition and burning than lighter oils. It is obvious, therefore, that larger engines running at relatively low rotary speed are better adapted to burn the heavier oils than smaller engines having a high rotary speed, because in the larger engines the temperature in the combustion chamber is higher and the time available to convey the fuel oil into the cumbustion chamber and to burn the fuel is longer than in smaller engines. For these reasons the manufacturers of Diesel engines generally will not find it difficult to run their larger, low-speed engines on heavy fuel oil, while in most cases they experience considerable trouble with their smaller high-speed engines when burning heavy oils.

Some Diesel engines have been operated for several years on Mexican oils, although not built for this service. This company has recently made exhaustive tests on engines designed to burn the heavier oils efficiently. The engine under test was a three-cylinder, single-acting, four-stroke, vertical Diesel having 13½-in.x19½-in. cylinders developing 200 b.-hp. at 257 r.p.m. There was no trouble in obtaining a clear exhaust from no load up to 20 per cent overload, the engine taking the heavy oil as readily as lighter oils. The consumption compared with the light oil was in proportion to their heat values.

The tests were made during January and February of this year. The heavy oil had to be heated, and it was necessary to equip the engine for this. This heating system was designed to heat the oil to a point where it could be handled by the circulating pump and would flow by gravity from an overhead tank through the filter to the fuel pump, where the temperature was kept constant regardless of load. The oil

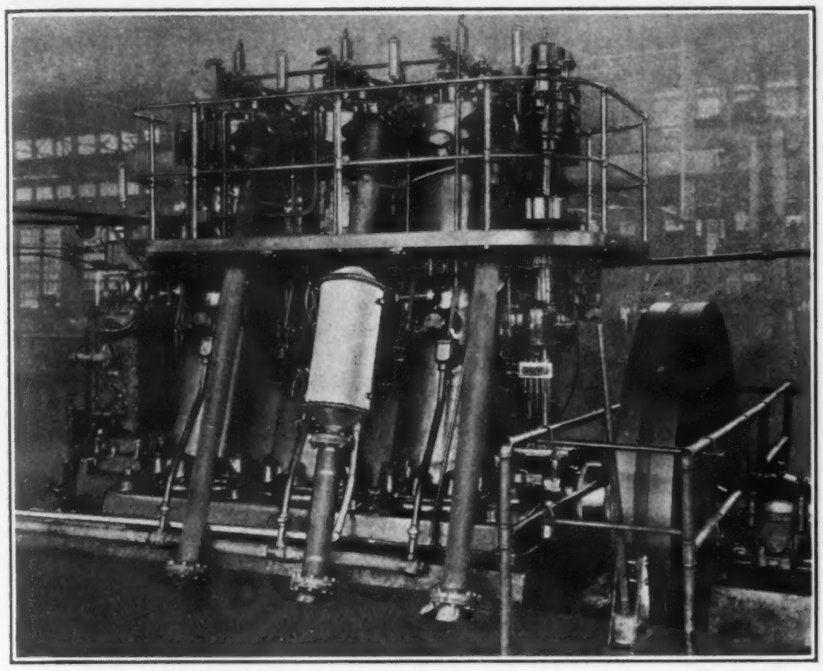


PIPING PLAN FOR BURNING HEAVY FUEL OIL

was heated once more just before it entered the fuel injection valve in order to lower its viscosity so that it could be readily atomized and conveyed into the combustion chamber by the injection air.

Referring now to the accompanying diagram showing the heating system used during the test, a water heater A was placed in the exhaust pipe of cylinder No. 2. This heater contained two heating coils so arranged that any desired water temperature could be obtained at all loads. The water was circulated by a pump *B* and distributed through the various heating coils in the fuel-oil sump tank *C*, fuel oil filter *D*, overhead service tank *E* and fuel pump *F*.

The heavy fuel oil was brought in barrels to the engine during the test and dumped into the sump tank *C*. Here it was heated so that it could be pumped to the tank *E*. The temperature of the oil in this tank was increased so that it could flow by gravity to the twin filter *D*, only one side of which was used. From the filter the oil ran by gravity to the fuel pump *F*. Another thermometer was attached just in front of the



THIS 200-B.-HP. DIESEL ENGINE SUCCESSFULLY BURNS HEAVY FUEL OIL

fuel pump, where the temperature was at all time kept approximately constant. From the fuel pump the oil was discharged through a heating coil in the exhaust port of the cylinder head, whence it passed through a check valve into the fuel valve.

Not only did the heating system for the fuel oil function very satisfactorily, but also the engine proper. It did not seem to make any difference whatsoever whether light or heavy fuel oil was used so far as the operation of the engine was concerned. The engine was thoroughly inspected at the end of the test and the cylinder liners were found well lubricated and highly polished. The tops of all pistons were free of carbon and none of the piston rings was gummed up, while the cylinder heads and exhaust valves were in good condition.

It was found necessary, just before stopping the engine, to change the fuel from heavy to light oil. This was done to clean the fuel pump and pipes of heavy fuel oil and to dispel the exhaust gases of the heavy fuel oil from the exhaust pipes. If this is not done, the moisture in the exhaust gases after the engine has been stopped will condense and unite with the sulphur dioxide contained in the exhaust gases, forming sulphuric acid, which would cause a heavy corrosion of the exhaust pipes.

The engine was started with light oil from the overhead tank *G*, passing through the filter *D*1 into the fuel pump while the heavy fuel was being heated. It took from one-half to three-quarters of an hour, depending on the temperature at the test stand, to heat the whole system, after which the fuel was changed from light to heavy fuel oil.

While the engine could be easily and successfully operated under fluctuating loads down to no load, with perfectly clear exhaust, a continuous run without any load was not altogether satisfactory after the temperature of the combustion chambers corresponded to no load. These conditions, however, were improved after the compression was temporarily raised from the normal (475 lb. to 530 lb.). There was no difficulty in always obtaining perfectly clear exhaust when the engine was operated with normal compression and when running at quarter load.

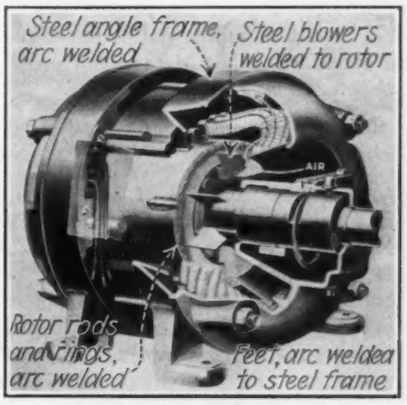
The results obtained with the heavy fuel oil were to a great extent due to proper functioning of the fuel-oil heating system, the proper selection of the injection pressure, atomizer plates, atomizer nozzle and some other refinements of the Fulton Diesel. The atomizers used follow, in general, conventional lines.

The tests referred to proved that smaller Diesel engines as well as large ones can burn heavy fuel oil successfully, even at fluctuating loads, provided they are properly designed and equipped with a suitable fuel-oil heating system. Unless the engine is built to burn heavy fuel oils successfully, and actually does so with perfectly clear exhaust, it is not advisable to use heavy fuel oil, as the savings would be more than counterbalanced by increased maintenance cost and frequent shutdowns.

Electric Welding Applied to Motor Building

A NEW application of arc welding to the manufacture of motors has recently been developed. In this process the end frame of the motor is made by rolling a standard steel angle to circular shape, then joining the ends with the arc welder. The feet are drop forgings welded to the angle-steel frame. The blowers for ventilation are welded to the rotor or armature by arc welding, and lastly the copper rods or windings of the rotor are welded to the short-circuiting rings, preventing any loosening or current leakage at this point.

The interest in this for most manufacturers is the improvement which has been made possible in design while at the same time reducing manufacturing costs. Generally speaking the casting costs two to three times as much as the steel for the same part and is only about one-fifth as strong. As an instance of this, the end frame being rolled from a standard steel angle is of much thinner section than the casting formerly required. This gives much more ventilating space between frame and coils and far better cooling.


Steel angle frame, arc welded
Steel blowers welded to rotor
AIR
Rotor rods and rings, arc welded
Feet, arc welded to steel frame

PLACES IN MOTOR NOW BEING ARC-WELDED

At the same time, the steel frame can be hot-riveted and be drawn up tighter without breakage, thus holding the stator laminations more firmly and producing a better electrical field. This process is being used by the Lincoln Electric Company in a motor design recently placed on the market.

Central Station Business

What Taxes Mean in the Price of Electricity

AS A PRACTICAL illustration of the tremendous burden of taxation carried by a public utility the Nebraska Power Company in Omaha recently issued a statement to its customers calling their attention to the fact that if the company did not have to pay taxes it could sell electricity to residential customers for 3 cents a kilowatt-hour. During the year 1923 the company's total tax payments were $361,220 and its gross income for the year was $3,807,567, so that out of every dollar received for service 9½ cents went for taxes. Had this $361,220 of taxes not been required, the company could immediately have reduced its residential lighting rate from 5½ cents per kilowatt-hour to approximately 3 cents.

In this connection the statement pointed out that the municipal plants do not pay taxes, and therefore have a tremendous advantage over privately owned plants. "The taxes which the municipal plants do not pay have," it said, "to be made up by the rest of the people, and the net result of municipal ownership is a greater burden of taxation on the people at large."

Additional Taxes

Another condition in Omaha affecting the taxation of public utilities only is an occupation tax. The Nebraska Power Company paid in 1923 to the city of Omaha as an occupation tax $93,796, simply for the privilege of operating, in addition to the regular city, county and state taxes paid by the company like all other persons and corporations in the community.

"This occupation tax," said the company's statement, "is an added burden upon the people of Omaha using electric power and light, and to the same extent lifts off of the shoulders of the people who do not use electric power and light a part of their just tax burden. This tax is clearly a discrimination against the people who use electric power and light."

By and large the Nebraska Power Company, like all privately owned public utilities, is manifestly a very important tax factor in the community it serves.

Advertising a Company's Service to Its Smallest Consumers

TO IMPRESS upon its customers and the public that no installation is too large or too small to receive an equal degree of careful, courteous attention, the New York Edison Company recently prepared a full-page advertisement to picture a number of New York City's smallest consumers of light, heat and power. Around the margin of the advertisement in pen-and-ink sketches were illustrated the premises of some very small customers—newspaper, fruit, soda, candy and boot-polishing stands, even a small houseboat and a life-saving station. Some had but a single lamp.

Attention was called to the fact that during the last year the New York Edison Company rendered 800,000 bills of less than $1 monthly, the average being probably less than 50 cents monthly. In the same period some single customer's bills were in excess of $100,000. The company is proud that the same character of service was rendered to each class of consumer and that, however small or however large the existing or prospective use of electric energy, it is always at the service of its customers.

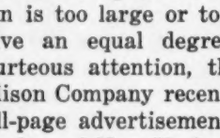
Co-operative Display Fills Central-Station Window

THE "Ann Street window" of the Hartford (Conn.) Electric Light Company is known to central-station men far and wide as the setting for many notable demonstrations of show-window illumination.

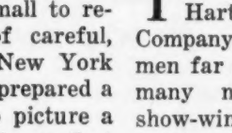
Here for many months the Hartford Electric Light Company has given local merchants space to display their goods under the most favorable conditions of white and colored lighting, the customary duration of each display being one week. Retail sales in Hartford have been stimulated by this window, and many merchants have improved the illumination of their own places as a result of its service.

The accompanying illustration of a recent display is of unusual interest because this exhibit not only featured modern window lighting but also emphasized the development of electric time service from central-

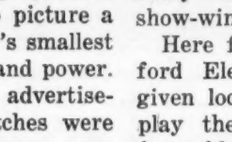
SKETCHES SHOW NEW YORK CITY'S SMALLEST LIGHT, HEAT AND POWER CONSUMERS



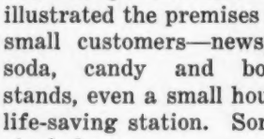
E Ohlendorf at 337 West 53rd St where dogs are clipped and boarded



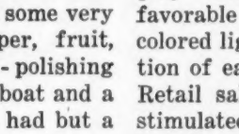
Sam Saporito at Fourth Ave and 10th St is a shoe shining specialist



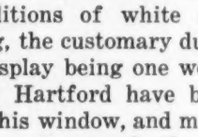
Thos O'Hara's House-Boat at East 176th St and the River



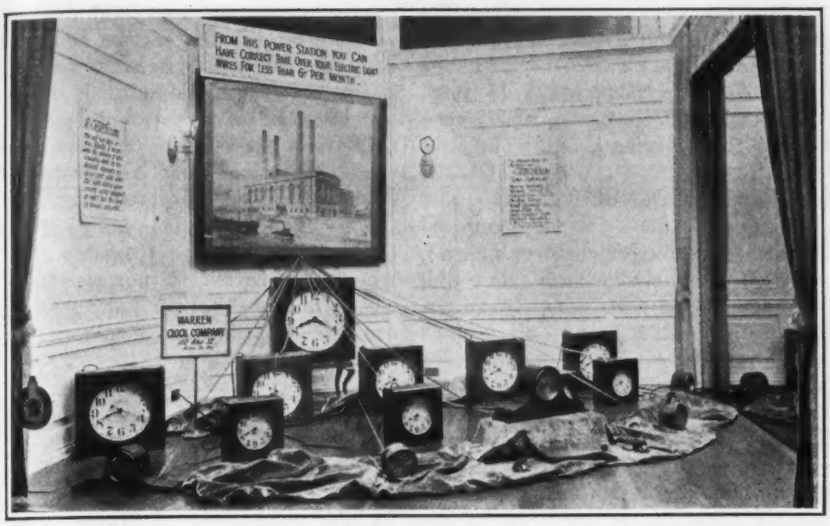
George Bravman at Madison Ave and 23rd St sells newspapers and current periodicals



M Margulies at N W corner of 140 St & Ryder Ave joined together two trolley cars for a lunchwagon



Vieta Golando at 405 East 19th St is an Ice and Coal dealer


FROM THIS POWER STATION YOU CAN
HAVE CORRECT TIME OVER YOUR ELECTRIC LIGHT
WIRES FOR LESS THAN 6¢ PER MONTH
WARREN
CLOCK COMPANY

SYNCHRONOUS CLOCKS MAKE INTERESTING DISPLAY IN HARTFORD COMPANY'S DEMONSTRATION WINDOW

station outlets connected with the Hartford company's new South Meadow plant and advertised a well-known manufacturer of synchronous clocks which operate from central station service.

Service Economies for Power Customers

Philadelphia Electric Company's General Service Department, Acting in Advisory Engineering Capacity for Power Users, Is Valuable Aid to Good Will

BY R. H. SILBERT
General Service Department, Philadelphia Electric Company

THE Philadelphia Electric Company maintains a general service department whose chief duties are to act in an advisory capacity to power customers concerning the most economical installation of electrical equipment and the utilization of energy. Not only does this department consult with and act for new customers who are making their initial installations, but it is always at the call of any customer who has some power problem to solve or emergency to meet. Certain principles and methods are observed in all negotiations with power users which have proved extremely valuable to the company in winning the friendship of customers. In all cases it is the practice of the general service department to assume the same attitude toward the customer and the company as would be the case if an engineering fee were being paid.

DEPARTMENT'S WORK CLASSIFIED INTO FOUR DIVISIONS

Specifically this department's work in effecting service economies may be classified into four divisions: Economy in installation cost, economy in space occupied, economy in continuous service, and economy in good will and public relations.

Economy in installation cost can be best effected by installing the necessary equipment adequately to care for the customer's needs. Fads or fancies of the designer should have no place in the installation unless they can show an economic or service value. Advantage must be taken of methods or apparatus as such are developed. The customer's installation should never be used as a laboratory to try out new methods or apparatus unless he is satisfied to help the industry to that extent.

Truck-type switchgear as against concrete compartment and switch units should be used where this is satisfactory to the customer. Attention is called to the safety features of this equipment as well as its ease of replacement. This lessens the time required to install the switching apparatus and thus makes for a lower installation cost. Close cooperation with the customer during the design and erection of the house or room to contain the apparatus often saves considerable time and expense.

These truck-type switches are more economical in space requirements in themselves, and in addition to this the instruments, pilot lights, indicators, etc., are an integral part of the unit. Space, it must be remembered, is a factor with the customer, both as to occupancy and cost of building a structure.

If other than truck-type switchgear is used, taking advantage of irregularities in the shape of the space assigned can react to the advantage of the customer. By properly designing the customer's substation, transformers, static condensers, etc., may be so placed as to use what would be otherwise wasted space.

CONTINUOUS SERVICE ESSENTIAL

Assurance of continuous service should receive the utmost consideration, for if the customer does not receive power at all times, his production is interfered with, his profits are lessened or wiped out and he is not able to continue business and use central-station service. This is a mistake which the industry in general, and our company in particular, cannot rest under, so this phase of the installation must have the best thought of the designer and the best workmanship of the construction man.

Attention must be given to confining a fault and the resulting disturbance to the particular piece of apparatus on which it occurs. Proper spacing of exposed live parts from each other and from ground should receive the utmost attention. The rapidity with which repairs and replacements can be made must be considered in the original design and installation, because things do happen on 13,200-volt equipment that are somewhat embarrassing. The nameplate data tell everything except when the apparatus will fail.

CONVENIENT LOCATION OF BULKY EQUIPMENT

Apparatus with readily replaced parts should be used. Bulky equipment, such as a transformer, should be so placed that it can be removed without disturbing other apparatus or causing other parts of the installation to be out of service during its removal.

Additional sources of energy supply from the company's system should be installed for such customers as transportation companies or chemical plants where a stoppage means building up the cycle all over again. Moreover, theaters, hotels,

office buildings, etc., should have more than one service, preferably from different substations or feeders, as a loss of service here has not only a monetary value to the customer and the company, but a certain moral effect which reacts on the company.

ECONOMY IN GOOD WILL AND PUBLIC RELATIONS

In addition to what may be done in the way just outlined, good will must be obtained and maintained or all is not accomplished that could be to make real friends for the company. Ready, cheerful willingness to help the customer with his problems at all times is paramount. An installation can be made as indicated and operate successfully and economically for a few years, at the end of which time something may occur that needs expert attention and service. The customer, being engaged in manufacturing a product or selling a service, is not equipped by skill or knowledge to cope with the situation. It is at this time that the company can render the customer a service that pays a greater return than can be measured in money. Our experience and organization should be placed at his disposal to help him out of a bad fix. He, of course, pays our bill for labor and material, but long after the bill is paid he remembers our help in his time of need, and thus good will is established at no expense to the company.

A TYPICAL EMERGENCY

The following case, involving the breakdown of a 75-kva. transformer at an auto-body builder's plant in January, 1924, illustrates the point. About 6 p.m. a 75-kw., 220/110-volt transformer failed. The customer's plant superintendent was notified. After arriving at plant and making an inspection he called the writer at 7:20 p.m. He said that the transformer was burned out and they were anxious to know if we had such a transformer. Getting in touch with our transmission engineer, he advised that two 75-kw. transformers could be used and by a step-up-step-down connection service could be restored. The customer's superintendent was then told that the trouble could be overcome as indicated by means of the two transformers. He said: "Go ahead; spare no expense, but get the transformers in as soon as possible."

Our company's transportation division was then notified to go to the storeroom, get the two transformers and deliver them to the customer, the storekeeper being advised in the meantime. The transformers reached the customer's plant at 9:15 p.m., were taken off the truck and placed in the transformer room. The first transformer was set in place at 12:02 a.m. and the second at 12:25 a.m. The transformers were connected and made ready for cut-over of load, which was started at 3:20 a.m. and completed 3:55 a.m. They were cut off the lines at 4:05 a.m. on account of a hot lead due to a wrong connection, but were reconnected properly and back on the line carrying load at 4:55 a.m.

This customer operates a metal-stamping plant manufacturing automobile parts and at the time of the failure was operating a night force in addition to his regular day force. The transformer that failed was of peculiar ratio (220 volts primary, 110/220 secondary) and was manufactured in St. Louis. To ship this transformer to St. Louis and have it repaired would have taken from two or three weeks. To have the coils made and shipped to Philadelphia would have meant the elapse of ten days before the transformer would have been back in service. Counting the loss which would be sustained by this customer during that period, it is easy to see why he thinks so much of the company, when for $24 he had service eleven hours after the transformer failed. The defective transformer was repaired during regular working hours, and there was no extra expense for expressage, overtime, etc.

We feel that the four points discussed have a great deal to do with the continued success of the Philadelphia Electric Company in its relation to its customers, and this condition will continue to grow more important as the company grows larger and its responsibilities increase.

Service Bureau Uncovers Silent Complaints

TO OBTAIN a first-hand view from its customers as to their opinion of the power and light service they are being supplied with, the Northern States Power Company has established a customer service bureau, members of which are furnished with a service car to call on every one of the company's customers throughout its territory. These men simply extend the greetings of the company and inquire whether or not the service rendered by it is satisfactory in every respect. In cases where complaint is registered the bureau representative immediately takes steps to eliminate the trouble and turn a dissatisfied customer into a contented one. Customers can purchase lamps from these representatives from the stock which they carry. Minor repairs of electrical and other appliances which are out of order are also made by these men whenever requested.

Life of Electric Trucks Is Ten to Twenty Years

THE oldest electric vehicle in active service in Chicago has been discovered by the Electric Truck Bureau of the Commonwealth Edison Company, which submits the accompanying view of the truck. It was made in 1909 and has been in continuous service ever since for the International Dairy Company.

According to the records of the bureau, there are 156 other electric

CHICAGO'S FIFTEEN-YEAR-OLD ELECTRIC TRUCK

trucks in the United States which have been in service fifteen years or more. Seventy-four have been in service eighteen years or more and twenty-five have been in operation twenty-five years or more. Some of these electric trucks are in daily operation yet.

"How long, then, will modern, refined-design, alloy-steel-constructed electric trucks last?" B. T. Martin of the bureau asks, replying to his own question by saying, "We do not know." E. E. La Schum, general superintendent American Railway Express Company, says: "Electrics manufactured today should be economical for as long as twenty years." It will be conservative, Mr. Martin thinks, to figure on a life of from ten to twenty years.

Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
from All Parts of the World

Photostat copies or English translations of complete articles will be furnished at cost upon request

Hydro-Electric Development and Steam Equipment

Colloid Chemistry and Scale Prevention in Boilers.—E. M. PARTRIDGE.—The author points out that chemistry of compounds or interior treatment for boiler-feed water is essentially different from the chemistry of water softening by means of the addition of compounds. One important phase of compound treatment involves the addition of colloidal matter to the water, which may or may not enter into the chemical combination with the scale-forming salts, but which does affect their physical nature when precipiated so as to render them sludge-forming rather than scale-forming. — *Power*, July 8, 1924.

Hydraulic Installations in Canada in 1923. — This is an abstract of the hydraulic power committee report of the Canadian Electrical Association. An account is given of the Isle Maligne Station, which, when completed, will contain twelve 45,000-hp. hydro-electric units operating under a head of 110 ft., making the total output 540,000 hp. Other notab'e developments in Canada during 1923 are reviewed.—*Electrical News*, July 15, 1924.

Transition from Steam to Electric Drive for Central-Station Auxiliaries.—E. E. THOMAS.—The electrification of steam-plant auxiliaries has been much in evidence during the last two or three years, although its inception was more than ten years ago. In this short article the author reviews the progress that has been made since 1900 in the centralization of the production of electric power. Economical advantages gained by central-station development together with increased reliability of service have unified the efforts of engineers to produce larger prime movers and boilers so as to conserve space and obtain maximum plant efficiency.—*Central Station*, July, 1924.

Generation, Control, Switching and Protection

Clock Switches for Street Lighting.—A. F. E. HANSON.—A discussion illustrated with ten curves and photographs is given of clocks and switches used in street-lighting equipment. Clock errors due to atmospheric conditions are shown. The author gives the results of an experimental comparison of silver, copper, platinum, platinum substitute and iron for contact surface. He comes to the conclusion that spherical silver contacts give the best results for currents of 15 amp. to 50 amp.—*Sterkstroom* (*Holland*), May 21, 1924.

Stability of Direct-Current Generators.—C. LYNN.—This subject is particularly treated from the standpoint of low voltages or when direct-current generators are used with voltage regulators. Instability, or the inability of a generator to maintain its voltage under various operating conditions, may be indicated by several observations which are described. Methods for correcting voltage fluctuations are given. However, the only positive method of securing absolute stability and assurance against reversal of polarity of direct-current generators under all conditions of operation is to excite them separately.—*Electric Journal*, July, 1924.

Power from the Earth's Heat.—T. T. READ.—The ever-increasing demand for power will at some time in the future lead to a careful study of all of its possible sources. At the present time there are several points where, through the bubbling of geysers or hot springs, the heat of the earth is used. The author particularly studies the subject of how the earth's temperature increases toward its center. Following this he gives a résumé of published material about actual installations at favorable places on the earth's surface and of the plans proposed by well-known engineers for further development. — *Mechanical Engineering*, August, 1924.

Transmission, Substations and Distribution

Automatic Substations in Metropolitan Districts.—C. W. PLACE. — The present trend to interconnection and the installation of large-capacity stations, with the changing character of city load, make relief of the operating crew of a system of the greatest importance. This can best be insured by the use of automatically controlled substations in the various types of service. Equipment for each class of service is in successful operation, showing great dependability, and any particular problem of the operating companies can be attacked, keeping in mind certain fundamentals of design, construction and application.—*Journal of A. I. E. E.*, July, 1924.

Supervising Systems for the Remote Control of Unattended Substations.—C. J. SARJEANT and T. N. RILEY.—The supervisory systems of control for load dispatchers described in this article have been developed primarily to eliminate the human element and to indicate automatically to the load dispatcher the exact position of all operating units in the system and in certain arrangements to place it within his power to operate them directly. Three distinct schemes have been developed which are described in detail along with their particular application. These schemes are the distributor, selector and cable systems. — *Electrical Review* (*England*), July 4, 1924.

Voltage Regulation.—F. F. AMBUHL.—The amount and cost of voltage regulation will depend on the voltage variation of the power supply and of the feeders, also on the purpose for which power is used. If a feeder is to supply an industrial load, such as induction motors, a variation of 10 per cent would not be objectionable, as this amount of variation in voltage does not cause an appreciable drop in the speed of an induction motor. On the other hand, if the feeder was supplying a lighting load, a 10 per cent variation (say 4 per cent in supply and 6 per cent in feeder voltage) would cause approximately 35 per cent variation in candlepower of the lighting. After discussing various methods of voltage regulation, the author concludes that the most satisfactory method of correction is the installation of automatic induction regulators on the 2,300-volt or 4,000-volt lighting feeders and not in the transmission or generation system.—*Electrical News*, July 1, 1924.

Units, Measurements and Instruments

Remote Metering by the Impulse and Condenser Method.—B. H. SMITH.—The impulse method of transmitting power readings, in which the charge and discharge of a condenser are utilized in conjunction with an ampere-hour meter, forms a simple and reliable method of converting the impulse rates into readable values. In this system the power whose measurement is to be carried to a distant point is measured on a watt-hour meter or sender at a convenient point and this meter is equipped with a commutator or interrupter on the disk shaft, so that for each revolution of the disk a relay circuit is made and broken several times. The contacts are connected to a direct-current supply and arranged so that impulses of alternating polarity are furnished. At the receiving end, if watt-hour readings are desired, it is necessary only to install an electric counter, such as is used in telephone exchanges for counting the number of calls. The application of this principle to indicating meters is also described.—*Electric Journal*, August, 1924.

Measurement of Temperature in a Rotating Armature by Means of Thermocouples.—B. G. CHURCHER. — The author deals with the measurement of temperature in the rotating armature of an electrical machine by means of thermocouples. To connect the thermocouples to the measuring instrument it is necessary to employ contact rings and brushes on the machine under investigation. A form of contact ring and brush which has been found to give satisfactory results is described. The location of the cold junction of the thermocouple is discussed. The errors which may arise in using the method are considered, such as those due to thermal electromotive forces and variable contact resistance at the rings and brushes and to induced electromotive forces arising from the passage of conductors included in the thermocouple circuit through leakage magnetic fields. It is shown that these

errors can be made sufficiently small to permit the measurement of temperature changes of short duration to approximately 0.1 deg. C. The measurement of actual temperatures can also be carried out, but to a somewhat lower degree of accuracy.—*Journal of Scientific Instruments* (*England*), July, 1924.

Illumination

Symposium on Office Lighting.—A. B. ODAY, H. A. SINCLAIR and J. H. BLITZER.—At one of the regular New York section meetings of the society each of the above authors presented a solution of a problem on office lighting prepared by the papers committee. The problem was to light efficiently the third floor of a modern office building in the business section of a city with windows on the south side, the ceiling height being 11 ft. Reflection factors were given. The presentation of these three papers was followed by a long discussion, which is given in full.—*Transactions of I. E. S.*, July, 1924.

Use of Light for Display Purposes.—M. PARTRIDGE.—The author refers mainly to shop-window lighting of the ordinary type, but also gives an account of the new neon signs.—*Illuminating Engineers* (*England*), Vol. XVII, No. 4.

Safety Traffic Signals on Highways.—R. J. DURLEY.—The author points out that a uniform system of signals for highways and vehicles is necessary for public safety. There is a great need for co-operation between all organizations interested in this work. He reviews the work being done in Canada and the United States in this respect.—*Canadian Engineer*, July 22, 1924.

Electrophysics, Electrochemistry and Batteries

Pickling of Iron and Steel.—V. S. POLANSKY.—A bibliography has been compiled by the author on this subject. It is divided into eight sections, namely: (1) General and miscellaneous, (2) machine and equipment, (3) pickling in acid solutions, (4) pickling in salt solutions, (5) electrolytic pickling, (6) inhibitors and accelerators, (7) effect of pickling, and (8) recovery of spent liquors.—*Blast Furnace and Steel Plant*, July, 1924.

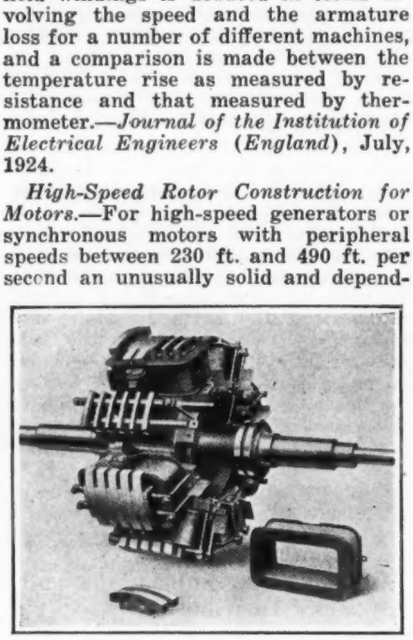
Fundamentals of Electrostatic Precipitation.—The recent application of electrical precipitators at the Trenton Channel station makes the subject of electrostatic precipitation one of interest to power-plant engineers. In this article the details of the various processes are described, followed by a method of constructing precipitators and detailed applications.—*Power Plant Engineering*, July 15, 1924.

Studies of Electric Discharges in Gases at Low Pressure—Part II.—IRVING LANGMUIR and HAROLD MOTT-SMITH, JR.—This series of articles reports an investigation in which new methods of using collecting electrodes were applied to the determination of the complicated discharge phenomena that take place in an atmosphere of low gas pressure.—*General Electric Review*, August, 1924.

Motors and Control

Rise and Distribution of Temperature in Small Electrical Machines.—E. HUGHES.—The author deals with the factors influencing the shape of the heating and cooling curves of coils and electric machines. The thermal conductivity of the insulation is calculated by alternative methods from the distribution of rises, and the influence of different air velocities upon the thermal conductivity and upon the temperature rise per watt is considered. A new arrangement for measuring the mean temperature rise of field windings is described. The temperature rise of the field windings is deduced in terms involving the speed and the armature loss for a number of different machines, and a comparison is made between the temperature rise as measured by resistance and that measured by thermometer.—*Journal of the Institution of Electrical Engineers* (*England*), July, 1924.

High-Speed Rotor Construction for Motors.—For high-speed generators or synchronous motors with peripheral speeds between 230 ft. and 490 ft. per second an unusually solid and dependable rotor construction has been developed which is described in this paper. The rotor body is built up of three or more heavy steel rings heat-shrunk upon the rotor spider. Each of these disks has forged-out teeth corresponding in number to the poles of the rotor. Over these teeth are slipped the field coils, which are retained by pole pieces fitting between the teeth and held in place by two heavy bolts per pole, going through all the teeth, and inserted pole pieces. The most favorable dimensioning of the toothed disks for a maximum of mechanical strength is given.—*Bulletin Oerlikon*, June, 1924.



THIS ROTOR IS DESIGNED FOR PERIPHERAL SPEEDS UP TO 490 FT. PER SECOND

Experimental Study of Air-Lift Pumps and Application of Results to Design.—C. N. WARD and L. H. KESSLER.—The experimental work on the air-lift pump presented in this bulletin was started in 1919 when the problem arose of selecting foot pieces for air-lift pumps which were to be installed in certain wells in Wisconsin. The preliminary work confirmed the deductions made from data taken in previous air-lift experimental work. Further experiments were then conducted, along the lines suggested by the preliminary tests, upon apparatus which was somewhat larger. This bulletin of 150 pages, with sixteen tables and sixty illustrations, considers the entire subject in detail.—*Bulletin No. 1265 of the Engineering Experimental Station, University of Wisconsin.*

The Synchronous Induction Motor.—H. COTTON.—The result of a very careful research has been the invention of the synchronous induction motor. This type of motor possesses the advantage over the ordinary type of motor of giving high starting and synchronizing torques. It is now being manufactured in large sizes in England and in Europe. The general theory of operation of the synchronous induction motor is considered, the conditions of slip examined in detail and the equation of slip motion deduced.—*World Power* (*England*), June and July, 1924.

Heat Applications and Material Handling

Electric Welding.—W. H. DRUKKER.—A report is given of a demonstration of eight different makes of welding apparatus held by the Municipal Central Station Company of Amsterdam (Holland). Advantages of the different systems are brought out.—*Sterkstroom* (*Holland*), May 21, 1924.

Electric Furnace Development.—FRANK HODSON.—The early history of the electric melting furnace is very closely interwoven with the names of Siemens, Hale, Ferranti, Moissan and Cowles, and closely following comes Colby with an induction furnace for melting metals, followed by Heroult, Girod, Keller and Chaplet in France, Soderberg, Hiorth and Harden in Norway, Gronwall, Rennerfelt and Kjellin in Sweden, Rochling-Rodenhauser, Frick, Methusius in Germany, Stassano and Catani in Italy, and Hering and Snyder in America. The work that these men have done in developing the plain arc, the indirect arc, the arc-resistance and the induction furnace is pointed out by the author.—*Blast Furnace and Steel Plant*, July, 1924.

Traction

Building the Waukegan Cut-Off on the North Shore Line.—An initial 5-mile section of a new right-of-way between Chicago and Waukegan has been acquired by the Chicago, North Shore & Milwaukee Railroad and construction work is under way. Grade separation at street and railroad crossings insures fast schedule. The use of automatic pumps has solved the difficulty of the drainage problem.—*Electric Railway Journal*, July 26, 1924.

Electric Railway Installation in Japan.—M. TAKAGI.—An account is given of the 1,500-volt direct-current electric railway installation of the Kobe-Himeji Railway Company at Kobe, Japan. This article is particularly interesting because it describes the first electrification in Japan to utilize 1,500-volt interurban cars as distinct from locomotive-drawn trains. The installation includes seventy-two 750/1,500-volt motors, eighteen sets of pneumatic-cam control equipment and as many air-brake equipment, together with the necessary cars, substation and line material.—*General Electric Review*, August, 1924.

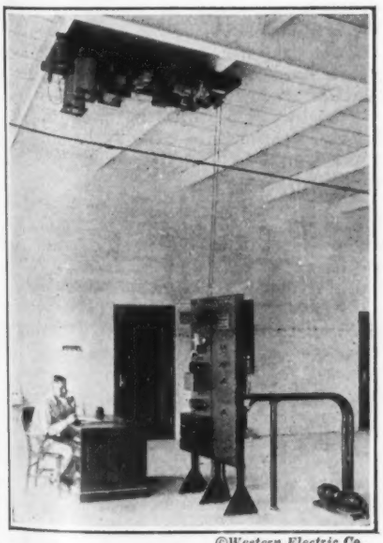
News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rulings and News of Electrical Men

Clarion River Plant Starts

Piney Station of Penn Public Service Corporation Is First of Three Hydro Developments

THE new hydro-electric plant of the Penn Public Service Corporation of Johnstown, Pa., was started up on Monday, August 25, in the presence of twelve hundred invited guests. This station, known as the Piney plant, is on the Clarion River, 66 miles from the company's generating station at Seward, Pa., with which it is connected by 66,000-volt transmission lines. It will serve twelve Pennsylvania counties and is the first to be developed of three projects on the Clarion River which are to be put through by the controlling organization, the Pennsylvania Electric Company, and of which the total ultimate cost is put at $28,000,000. The other two plants are to be built at Foxburg and Mill Creek. The dam at Piney is 75 ft. high; that at Foxburg will be about 175 ft. and that at Mill Creek about 250 ft. The ultimate installations at the three plants will be respectively 44,000 hp., 88,000 hp. and 130,000 hp.



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TALKING OVER HIGH-TENSION WIRES AT PINEY

The plant which has just gone into service begins with two 12,000-kva. vertical waterwheel generators, supplied, together with transformers and switching equipment, by the Westinghouse Electric & Manufacturing Company. One of its features is the carrier-current system installed by the Western Electric Company which permits telephonic communication over the high-tension wires to Seward. Several hundred persons, engineers and guests, it is reported, "tried out" this method of telephoning during the time that the plant was open for inspection on Monday. A severe thunderstorm burst over the plant while the demonstration was going on, but communication was carried on without interruption.

Susquehanna Plant Assured

Conowingo Falls Development to Go Ahead—Initial Rating, 180,000 Hp. —Final Rating, 300,000 Hp.

PLANS for the long-projected great hydro-electric plant on the Maryland side of the Susquehanna River at Conowingo Falls have taken final shape, and though the exact site of the plant is not yet determined, no doubt remains that it will be built. The Susquehanna Power Company, to which a permit for the development of this water power was granted last year by the Federal Power Commission, has passed under the control of the Philadelphia Electric Company, into whose system the plant will feed and which will distribute all the energy to be generated. All rights-of-way along the river have been acquired, and most of the strips of land for the transmission line from Conowingo to Philadelphia have been bought. The financial details have been handled by Drexel & Company, Philadelphia bankers.

Construction is waiting on the final determination of the site, but the plans are understood to be complete. They call for a concrete dam 3,300 ft. long with an average head 62 ft. above the bed of the river and a power house 120 ft. wide and 700 ft. long. Eventually ten turbines of 30,000 hp. each will be installed, but the initial installation will be six turbines with 180,000 hp. Expenditure at the outset is estimated at $15,000,000, which is approximately half of what the completed plant will cost.

Included in the preliminary work will be raising 20 miles of the roadbed of the Columbia & Port Deposit Railroad, a branch of the Pennsylvania Railroad.

The Susquehanna Power Company will present an application for license to the Federal Power Commission in the near future covering the Conowingo site. The preparation of the plans for the license has been intrusted to Jackson & Moreland of Boston.

Rushing Equipment to California

General Electric Company, to Give Aid in Fighting Power Shortage, Ships Turbine-Generator and Auxiliaries to Southern Edison Company Nine Months Ahead of Schedule

TWENTY-TWO carloads of steam and electrical equipment were dispatched as a special train from Schenectady, N. Y., last Saturday night, August 23, by the General Electric Company to the Southern California Edison Company. This equipment has been shipped nine weeks ahead of schedule time, its completion having been rushed in order to help combat the shortage of power in southern California caused by the unprecedented drought. It includes a complete turbine-generator unit, with accessories, for the 100,000-kw. steam-power station that is being hurried to completion by the Southern California Edison Company at Power, near Long Beach, Cal. The orders for the equipment were placed in January. Under ordinary circumstances this shipment would be of interest chiefly because it represents the largest single generating unit ever shipped west of the Rocky Mountains. This fact, however, is eclipsed by the way in which the order was rushed from foundry to final test.

Included in the shipment are one 35,000-kw. turbine-generator, one 2,800-kw. house generator with 45-kw. directly connected exciter, two motor-operated field rheostats for main and auxiliary generators, five 100-hp. motors, one solenoid-operated field rheostat for exciter, five 150-hp. motors, three 73,000-volt, 400-ampere oil circuit breakers, six 13,000-kva., oil-cooled transformers, one 350-kw. motor-generator set and other auxiliary equipment.

When the new unit is placed in operation it may mean the end of the present power curtailment, since it will enable the Southern California Edison Company to handle the winter lighting peak load and cut down purchases from other companies. It is thought that it will eliminate the necessity for the company to operate fifteen inefficient emergency plants, permit street cars again to operate on their regular schedule and make it possible to meet all power requirements.

The train is scheduled to arrive at its destination 182 hours after leaving Schenectady. It is routed over the Delaware & Hudson, Erie, Chicago & Northwestern and Union Pacific railroads. It will be at once unloaded and installation begun when it reaches Power, where Stone & Webster have more than a thousand workmen employed and are making every effort to hasten the plant's completion.

Plans of Grays Harbor Company at Aberdeen, Wash.

The Grays Harbor Railway & Light Company of Aberdeen, Wash., is about to install a steam unit that will virtually double its present generating capacity, as well as a new substation to handle the increased output, and is carrying out extensive improvements to its distribution lines. The new Westinghouse generator, which is to be set up in the present Electric Park steam station midway between Aberdeen and Hoquiam, has a capacity of 5,000 kw. and will be operated at 150 lb. gage pressure. Hogged sawmill waste will be the principal fuel, though the boiler will be equipped to burn powdered coal or oil.

The new substation, to be installed outside the Electric Park plant, consists of three 1,667-kva., 13,200/26,400-volt to 4,150-volt General Electric transformers. The distribution system is being changed from 2,300-volt, three-phase, delta operation to 4,150-volt, three-phase, four-wire "Y."

The work is being done by Sanderson & Porter. Its total estimated cost is $580,000. Completion is expected by the end of the year.

Blocked in its attempt to further its water and power project on the Wynooche River by the adverse decision, reported last week, of the Superior Court for Grays Harbor County, the City Council of Aberdeen, Wash., has directed the city attorney to appeal the case to the State Supreme Court. The project involved building a dam 240 ft. high across the Wynooche, tunneling 1½ miles to the headworks of the present city water supply on the Wishkah River, erecting at the dam a power house and installing equipment capable of generating 34,000 hp., constructing a transmission line to Aberdeen and building a substation and distribution system in Aberdeen. Its opponents claimed that this plan could not be carried out for the $2,000,000 voted.

As previously stated, the Grays Harbor Railway & Light Company has an application before the Federal Power Commission for water rights on the Wynooche. This application is in conflict with the city's, but if the latter is finally barred out, the company will probably receive the permit it desires. Other plans of this company include a 25,000 hydroelectric plant on the Hoh River, in Jefferson County, to cost $2,250,000, and a 14,000-hp. plant on the Qweets and tributary streams, to cost $1,600,000.

Forty-one Big Cities Ready for Home-Lighting Campaign

Forty-one out of the first fifty cities of the United States have signified their intention of holding home-lighting contests this fall, according to a report issued by the Lighting Educational Committee. These cities represent a population of more than twenty-five million, not counting their suburbs, which will invariably join with the cities in the contest. In each of these forty-one cities committees or electrical leagues have taken over the duty of organizing and financing for a contest, and the "key man" for each community is selected. The other nine cities included in the first fifty will undoubtedly hold contests, but word to this effect has not been received at the committee headquarters. In the forty-one cities it is expected that the contest will be offered to 1,500,000 children and that 600,000 will participate. Besides these cities more than a thousand smaller communities are now lined up for the campaign.

The big cities heard from are New York, Chicago, Philadelphia, Detroit, Cleveland, St. Louis, Boston, Pittsburgh, Buffalo, Milwaukee, Washington, Newark, Cincinnati, New Orleans, Minneapolis, Kansas City, Indianapolis, Jersey City, Rochester, Portland, Denver, Providence, Columbus, Louisville, St. Paul, Akron, Atlanta, Omaha, Worcester, Birmingham, Syracuse, Richmond, Memphis, San Antonio, Dallas, Dayton, Houston, Hartford, Grand Rapids, Paterson and Youngstown.

The nine cities in the first fifty not yet heard from are Los Angeles, San Francisco, Seattle, Baltimore, Toledo, Oakland, New Haven, Bridgeport and Scranton.

Holding companies all over the country are throwing themselves wholeheartedly into the campaign and are accepting the responsibility of contests in every community in which they serve. Some of the operating companies reporting this to be so are the American Gas & Electric Company, Central Maine Power Company, Texas Power & Light Company, Idaho Power Company, Utah Power & Light Company, Edison Electric Illuminating Company and the Meridian (Miss.) Light & Railway Company.

Investigation of Cleveland's Light Plant

City's Own Experts Find Municipal System Run at a Loss and with Poor Efficiency—Misleading Accounting System Severely Criticised

THE City Council of Cleveland about six months ago authorized a survey of the present physical condition of the municipal lighting system, its future needs, its earnings and its financial structure. This was carried on under the direction of the city's Director of Public Utilities with the approval of the City Manager. The study was made by A. B. Roberts, a member of the consulting engineering firm of the Withington-Roberts-Wright Company, and by the Municipal Research Bureau, which is under the direction of L. E. Carter. The investigation took five months, and the findings have just been published. The Ohio Committee on Public Utility Information finds these very significant and holds that they are of interest to the whole country inasmuch as the Cleveland city plant, which for ten years has sold electricity at an ostensible maximum price of 3 cents a kilowatt-hour, has long been an object of the attention of both advocates and opponents of municipal ownership.

SUMMARY OF THE SURVEY

As summarized by the committee just referred to—its summary being backed up by verbatim quotations from the reports of Mr. Roberts and Mr. Carter—the survey establishes:

That the municipal plant has accumulated a grand total net loss of $162,104.82 for its operation during the past nine years, when the proper consideration is given to taxes foregone and annual sinking-fund requirements to pay off indebtedness.

That a very large number of the municipal plant's domestic customers who have believed that they were paying only 3 cents a kilowatt-hour have actually been paying 7½ cents a kilowatt-hour by reason of the 75 cents monthly minimum charge.

That the public's present investment in the municipal plant is approximately $8,500,000, of which $6,611,000 is represented by bonds. That costs will exceed revenue by $300,000 a year, if the plant's capacity is increased to take care of a 60,000-kw. demand between now and the year 1945 through the issuance of an additional $11,000,000 worth of bonds.

That although approximately $8,500,000 has found its way into the plant's investment account, of which $6,611,000 is represented by bonds, the present depreciated value of the property is but $7,080,101.04.

That in only two of the past nine years has the gross revenue per kilowatt-hour been in excess of the cost of producing a kilowatt-hour of electricity, taking into consideration taxes foregone and sinking-fund requirements.

That the present numerical average condition of the plant's production system is but 55 per cent of new, and of the system as a whole but 71 per cent of new.

That most of the principal items of equipment are either inadequate or obsolete or both, while practically the entire production system is rapidly becoming obsolete.

That there is insufficient reserve capacity in generating units.

That a group of medium-sized consumers are paying the losses on the small lighting customers and the large power users.

That all customers of the plant consuming less than 70 kw.-hr. a month are being served below cost.

That rate readjustments are necessary immediately if the municipal plant is to continue to serve even the limited number it now serves.

That the municipal plant has not produced and cannot produce energy as cheaply as the privately owned and operated plant.

POOR ACCOUNTNG METHODS

That the bookkeeping and accounting procedure for the plant has been entirely inadequate and unsatisfactory.

That records have been handled under such a poor system that reports of the plant's financial condition have

not been available for six months after the close of the fiscal year, with the result that these statements were of only historical instead of practical value in guiding the management.

That the accounting procedure has been so loosely hung together that "misleading results" are likely, and that the plant should follow the system of accounting prescribed by the State Public Utilities Commission.

That most of the plant's deferred upkeep allowance has been put into new construction without keeping a record of the extent to which this allowance has been used for construction.

That municipal accounts for light and power have not been clearly separated from private accounts.

That the plant, even if it is to continue on its present basis, requires a reorganization at least of its auditing department, which has been handicapped by lack of adequate and competent supervision.

That on several occasions during the past nine years payment of maturities on serial bonds has been deferred.

That the present method of making Light Division appropriations is of little or no value and may be quite misleading.

That the situation which has obtained in the Division of Light and Power illustrates a lack of appreciation for the necessity and usefulness of adequate record keeping which is deplorable and indefensible.

That the management of the enterprise has from the beginning until the close of 1923 been peculiarly a one-man proposition, and that this one man has made it possible, for the time, to operate without guidance of periodic financial statements only because his long and intimate experience in the management of the business made it possible for him to take fragments of information from many sources and reach conclusions as to policy.

COMPARISON WITH PRIVATE PLANT

The Cleveland municipal electric light plant, the committee says, supplies energy to 35,394 customers. The Cleveland Electric Illuminating Company has 214,035 consumers in the metropolitan area of Cuyahoga County, in which Cleveland is situated. In the last nine years the municipal plant in Cleveland has added 19,886 patrons to its lines. The privately owned plant has increased the number of its customers in the same period by 138,845.

Institute Conventions Fixed

Midwinter Meeting in New York on February 9 to 12—St. Louis to Get Spring Meeting

AT ITS meeting on August 12 the board of directors of the American Institute of Electrical Engineers set February 9 to 12 inclusive as the time for the annual midwinter convention of the Institute in New York City. The board also determined to hold the spring convention in St. Louis, the date being not yet fixed.

President Osgood announced the committee appointments for the administrative year commencing August 1, 1924. The chairmen of the committees appointed are as follows:

GENERAL STANDING COMMITTEES

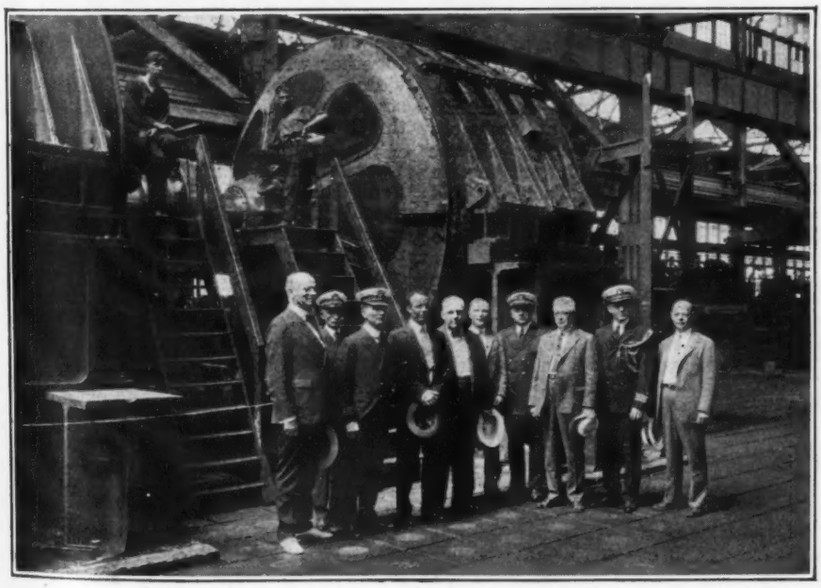
Executive.—Farley Osgood, Public Service Electric Company, Newark, N. J.
Finance.—G. L. Knight, Brooklyn Edison Company.
Meetings and Papers.—L. W. W. Morrow, ELECTRICAL WORLD, New York.
Publication.—Donald McNicol, Radio Corporation of America, New York.
Co-ordination of Institute Activities.—F. B. Jewett, Western Electric Company, New York.
Board of Examiners.—H. H. Norris, McGraw-Hill Company, New York.
Sections.—Harold B. Smith, Worcester Polytechnic Institute.
Student Branches.—C. E. Magnusson, University of Washington, Seattle.
Membership.—E. E. Dorting, Interborough Rapid Transit Company, New York.
Headquarters.—E. B. Craft, Western Electric Company, New York.
Law.—L. F. Morehouse, American Telephone & Telegraph Company, New York.
Public Policy.—H. W. Buck, Vielé, Blackwell & Buck, New York.
Code of Principles of Professional Conduct.—John W. Lieb, New York Edison Company.
Safety Codes.—Paul Spencer, United Gas Improvement Company, Philadelphia.
Standards.—H. S. Osborne, American Telephone & Telegraph Company, New York.
Edison Medal.—Gano Dunn, J. G. White Engineering Corporation, New York.
Award of Institute Prizes.—L. W. W. Morrow, ELECTRICAL WORLD, New York.
Columbia University Scholarship.—Francis Blossom, Sanderson & Porter, New York.

TECHNICAL COMMITTEES

Education.—Harold Pender, University of Pennsylvania, Philadelphia.
Electrical Machinery.—H. M. Hobart, General Electric Company, Schenectady, N. Y.
Electrochemistry and Electrometallurgy.—George W. Vinal, Bureau of Standards, Washington.
Electrophysics.—J. H. Morecroft, Columbia University, New York.
General Power Applications.—A. E. Waller, Ward Leonard Electric Company, Mount Vernon, N. Y.
Instruments and Measurements.—A. E. Knowlton, Yale University, New Haven.
Applications to Iron and Steel Production.—F. B. Crosby, Morgan Construction Company, Worcester.
Production and Application of Light.—G. H. Stickney, Edison Lamp Works, Harrison, N. J.
Applications to Marine Work.—L. C. Brooks, Bethlehem Shipbuilding Corporation, Quincy, Mass.
Applications to Mining Work.—F. L. Stone, General Electric Company, Schenectady.
Power Generation.—Vern E. Alden, Consolidated Gas, Electric Light & Power Company, Baltimore.
Protective Devices.—H. R. Woodrow, Brooklyn Edison Company.
Research.—John B. Whitehead, Johns Hopkins University, Baltimore.
Communication.—O. B. Blackwell, American Telephone & Telegraph Company, New York.
Power Transmission and Distribution.—Percy H. Thomas, consulting engineer, New York.

The board of directors confirmed the appointment by President Osgood of new members of the Edison medal committee, as follows: N. A. Carle, Public Service Production Company, Newark, N. J.; W. C. L. Eglin, Philadelphia Electric Company, and John W. Lieb, New York Edison Company, for terms of five years each; Samuel Insull, Commonwealth Edison Company, Chicago, to fill unexpired term of H. M. Byllesby, deceased. The board also elected three of its members as members of the Edison medal committee for terms of two years each, namely, L. F. Morehouse, Harris J. Ryan and Harold B. Smith.

Inspecting Motors for U. S. N. Airplane Carriers



AT THE Schenectady works of the General Electric Company on August 6 Assistant Secretary of the Navy Theodore Roosevelt, Rear Admiral Robinson and other navy men inspected the equipment which is being made there for the two airplane carriers *Lexington* and *Saratoga*, which includes large motors, turbines, control equipment, auxiliary apparatus and radio equipment. Each of the motors for the airplane carriers has a capacity of 22,500 hp. and measures 15 ft. in diameter. They will be connected in pairs to each of the four propellers and will deliver 45,000 hp. to each, or 180,000 hp. to all of them. This is the greatest horsepower per shaft that has ever been projected in any marine installation, irrespective of the type of motive power. The turbine-generators for the ships are each rated at 40,000 kva., 5,000 volts. Four units will be installed in each vessel. The turbines will be operated by steam from sixteen oil-fired boilers. The two ships are expected to be capable of making more than 33 knots an hour.

Catawba River Plants

This Carolina Stream an Example of Intensive and Intelligent Hydro Development

THE water-power stations on the Catawba River in North and South Carolina have now a generating capacity of 420,000 hp. and a storage capacity of 175,000,000,000 gal. of water, serving more than 300 cotton mills with 5,500,000 spindles, A. C. Lee of the engineering staff of the Southern Power Company told the North Carolina Section of the American Society of Civil Engineers, meeting in Asheville recently. He described the systematic development of this stream as a source of electrical energy from the time of the first small plants in the eighties down to the present. "With the two new developments now under construction," Mr. Lee said, "the Catawba River will be probably the finest example in America, or in the world for that matter, of the intensive and intelligent development of a great natural resource."

Mr. Lee had as his subject "The Progressive Development of the Catawba River." After describing the course of the river he said that its development began with the invention of the electric dynamo and the modern cotton spindle.

Up to 1890 power was transmitted direct to the mills, energy for lighting being furnished by a direct-current dynamo. Mills operated in this way were below the flood line and every year suffered heavy losses from high water. A hydro-electric station at Indian Hook Shoals, near Rock Hill, S. C., was completed in 1904 and had an effective head of 25 ft. The power house consisted of eight units, each generator being capable of generating 660 kw. at 11,000 volts. Power was transmitted over 13,000-volt lines to Rock Hill and Fort Mill, S. C., and Charlotte, N. C.

In 1905 the Southern Power Company was organized. The Great Falls plant was begun in 1905 and put in operation in 1906. This had eight double-runner horizontal wheels connected to 3,000-kw. generators, and power was transmitted over 44,000-volt transmission lines 60 miles to Charlotte. The similar Rocky Creek station, two miles down the river, was completed in 1909. In 1911 a 10,000-hp. station was built at Greenville, S. C., and one at Greensboro, N. C., with a third at Mount Holly, N. C.

With the invention of the thrust bearing the installation of vertical-type generators was possible, Mr. Lee said, making it possible to put the units above the flood line. The first turbine of this type was installed on the Catawba River in 1913 at the Lookout Shoals station, near Statesville, N. C., three units, each connected with a 10,000-hp. generator, being installed.

The Fishing Creek station was put into operation in 1916, 3 miles above the Great Falls station, and develops 50,000 hp. at a 50-ft. head. The Bridgewater station, begun in 1916 and finished in 1919, is essentially a storage development, he said. The generating plant here has two units with 13,000-hp. capacity at 135-ft. head.

After the Bridgewater station the Wateree station, near Camden, S. C., was started. This is the largest station the company has, generating 84,000 hp. at a 72-ft. head. During 1922 and 1923 two new water-power stations—the Dearborn station at Great Falls with a capacity of 60,000 hp. and the Mountain Island station, near Mount Holly, N. C., generating 80,000 hp.—went into commission. Two steam auxiliaries to these plants have generating capacities of 40,000 hp. and 20,000 hp. respectively. The station at Rhodhiss, N. C., will be completed in 1925 and will have 45,000 hp. at a 65-ft. head, and the new Catawba station is being built directly over the old station and will have a head of 65 ft.

In closing Mr. Lee said: "It is interesting to observe that in 1915 only fifteen cotton mills, with fewer than 175,000 spindles, were being operated by electricity generated on the Catawba River. Today more than 300 cotton mills, with a total of approximately 5,500,000 spindles, are being operated by the Catawba, to say nothing of the electricity that is being used in other industries and for lighting and other uses in several scores of cities and towns in the Carolinas."

Loan to Austrian Power Company to Be Floated Here

Announcement is made that a banking syndicate headed by F. J. Lisman & Company and Morgan, Livermore & Company, New York City, will float a three-million-dollar issue of 6½ per cent bonds for the Lower-Austrian Hydro-Electric Power Company. The company is known in Austria as "Newag," an abbreviation of its full name, Niederösterreichische Elektrizitäts Wirtschaft Aktien Gesellschaft, and maintains a government monopoly for the furnishing of hydro-electric power in the district of lower Austria which it serves. The bonds to be sold by the American bankers will be offered at 85 and accrued interest, to yield over 8 per cent.

This issue will be the first instance since the war of an American loan to an industry of Austria. It is expected to be the first of a series to be offered in New York and in London on behalf of prominent Austrian and German industries.

Seattle's New Plant to Go Into Service Next Week

Although the city of Seattle is engaged in a dispute with the contractors for the Gorge Creek tunnel work on the Skagit development involving an excess charge of $683,097 which may finally go to the courts for adjustment, its Board of Public Works, acting upon the written recommendation of Carl F. Uhden, chief engineer of the Skagit development, has formally accepted the tunnel as completed. Water was turned into the tunnel on August 2, and Mr. Uhden reports that the controls have been tested and are functioning satisfactorily. Minor troubles on the development are reported to have delayed temporarily the bringing in of Skagit energy, but it is announced that by September 1 everything will be in readiness to deliver power to Seattle over the 100-mile transmission line. This is ten and one-half months later than the contract time, but the contractors claim exemption from the prescribed penalty of $500 a day on the ground that the delays were the fault of the city.

Before the Power Board

Rival of Alabama Power Company Seeks Permit on Coosa—Two Schemes Dropped—"Project" Roads

THE People's Hydro-Electric Power Company of Birmingham, which is not a going concern, has applied to the Federal Power Commission for a preliminary permit covering a development at Lock No. 2 on the Coosa River. It is proposed to install machinery capable of developing 36,000 hp. Efforts have been made during the past fifteen years to interest Gadsden, Anniston and Birmingham in this development. From the information available the engineers of the commission cannot see how it would be possible for this development on the Coosa—the fluctuations of which are wide—to compete with the Alabama Power Company with its large system and abundant reserves, either in the matter of rates or regularity of service.

The Connecticut River Power Company, which has held a preliminary permit for nearly three years for a project at Windsor Locks, Conn., where 50,000 hp. is available, has notified the commission that it will not be able to apply for a license. It was found that the old vested rights along the river, together with the cost involved in providing for navigation, constituted obstacles which could not be overcome at this time.

The preliminary permit granted the Western Tie & Timber Company of St. Louis has expired. The permit covered a project on the Current River in Missouri, where it was planned to develop 20,000 hp. It was found that capital could not be attracted to the project because its size was not sufficient to justify its development at a distance from available markets.

Several Western power companies are trying to convince the commission that the cost of roads essential to the construction of projects should be regarded for accounting purposes as pertaining to project works. On the completion of the project the roads usually are turned over to the county authorities and dedicated to the public use. The counties, however, make no payment for these roads, but in most instances agree to maintain them. The commission has not been disposed to regard the investment in roads as a project cost when they are dedicated to the public. The power company makes the point that one investor's dollar is entitled to a return as much as that of another, and that the dollar going into roads which do not become a part of the permanent project should be considered in the same class as the dollar which is invested in a form for concrete work, which is cast aside when its use has been performed.

Water Power and Mining

Statistics Show that Canadian Mines Use More Hydro-Electricity than Steam-Made Energy

THE recent revival of activity in the mining industry of Canada has emphasized the necessity for ample supplies of power available at a cost which will permit of the mining and reduction of large quantities of raw material in many widely scattered localities and the marketing of the products at competitive prices.

The extent to which water power is now being used for mining purposes in Canada and its availability in mineral areas still unexploited have been given special study by the Dominion Water Power and Reclamation Service of the Department of the Interior of Canada. This study deals briefly with the relation of power to the mineral industry and of power supply to production, with descriptions of typical water-power installations for mining purposes.

The principal uses of power in mining are for compressing air for drilling; driving motors or engines for hoisting; haulage of ore above and below ground; driving ore crushers and conveyors; pumping for water supply and for the removal of ground water; lighting; heating; ventilating; signaling; machine, blacksmith and framing shops, and for various electro-metallurgical processes. Even in the comparatively simple mining processes involved in the recovery of coal as much as 10 per cent of the product may be consumed in generating the power required. The accompanying table shows the amount of power used in the principal divisions of the industry and the power in each division as on January 1, 1924.

TOTAL POWER USED IN CANADIAN MINING INDUSTRY

	Fuel Power, Hp.	Water Power — Generated, Hp.	Water Power — Purchased, Hp.	Total Power, Hp.	Per Cent
Metal mining	32,700	26,000	111,700	170,400	33.2
Coal mining	160,900	15,300	15,000	191,200	37.2
Non-metal mining	29,500	1,100	62,200	92,800	18.1
Structural material and clay products	12,800	2,000	44,300	59,100	11.5
Total	235,900	44,400	233,200	513,500	100.0

The relation of the primary power installed by the mining companies and the power purchased from electric central stations is also shown.

INSTALLED POWER AND PURCHASED POWER

	Horse-power	Per Cent
Primary power installed		
Fuel power	235,900	
Water power	44,400	
	280,300	54.6
Purchased power (all hydro-elec.)	233,200	45.4
	513,500	100.0
Proportions of water and fuel power		
Water power	277,600	54.0
Fuel power	235,900	46.0
	513,500	100.0
Proportions of fuel power.		
Steam		96.3
Gas		2.0
Oil		1.7
		100.0

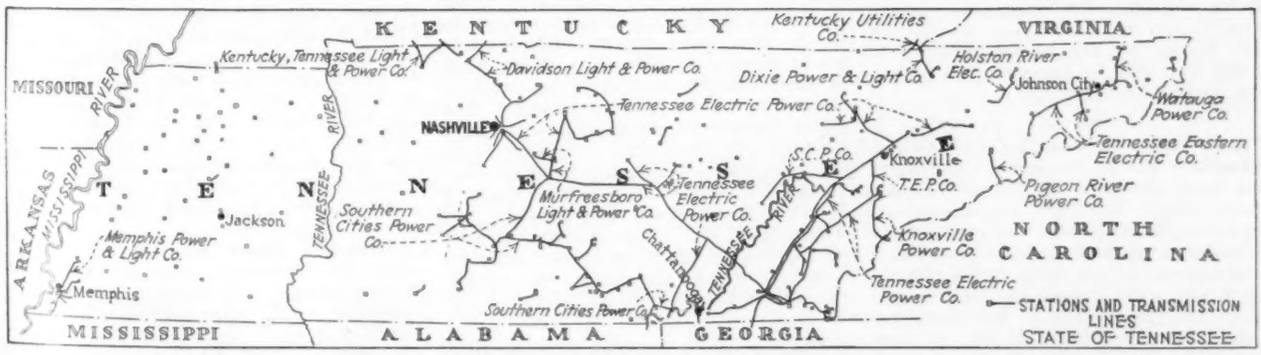
From the foregoing it will be seen that over half a million horsepower is used in the industry and that of this 54 per cent is water power, 44.6 per cent is steam power and 1.4 per cent is developed by use of internal-combustion engines.

Third High-Tension Conference in Paris Next June

The secretary-general of the International Conference on Large High-Tension Electric Systems announces that the third session of the conference will be held in Paris at the end of June, 1925. The first session was held in 1921, when twelve countries were represented by fifty-three delegates, and the second in 1923, when twenty countries were represented by 150 delegates. The third session, which will last a week, is expected to be still more important. The discussions will be in both French and English and will be based upon reports submitted by members of the conference. There were forty-five reports in 1921 and forty-nine in 1923.

The conference has for its object the study of all problems relating to the production of electrical energy in large steam and hydro-electric central stations, the interconnection of such stations, the construction of great high-tension electric networks and their utilization. A detailed program and all other information can be had on application to the secretary-general of the conference, J. Tribot Laspière, 25 Boulevard Malesherbes, Paris.

Tennessee Commission Issues Central-Station and Transmission Map of State



A MAP has just been published by the Railroad and Public Utilities Commission of the State of Tennessee showing all the central stations and substations and transmission lines used in public service in the state. This part of the map, though with only the names of a few of the chief cities indicated, is reproduced above. In the map as issued by the commission not only are the counties, cities, towns and villages and the steam and electric railroads shown, but also private and municipal electric stations are differentiated from each other and as regards whether they depend on steam, oil or water power for the generation of energy. The distribution lines are divided on the map into double-circuit and single-circuit tower lines, showing also single-circuit lines on double-circuit towers and double-circuit and single-circuit pole lines.

This is the first power map of Tennessee to be published. It shows that the number of miles of high-voltage transmission lines in the state on June 1, 1924, was 1,392.6, which is three times the greatest length of the state. The number of steam plants was eighty-three, of which sixty-three were privately owned and twenty municipal. There were twenty-three oil plants, of which eight were municipal, and twenty-one hydro-electric installations, two of these being municipal. These 127 plants have a total generating capacity of approximately 455,000 hp. and represent an investment of $64,500,000, of which only $1,500,000 is in municipal plants.

Except for a distance of about 25 miles from Greeneville to White Pine and a distance of 5 miles from Cedar Hill to Adams, Tenn., there is a high-voltage transmission line extending all the way from Bristol, Va., through Knoxville, Chattanooga, Nashville and Clarksville to Hopkinsville, Ky. It is also stated that a line is contemplated by the Kentucky-Tennessee Light & Power Company from Hopkinsville, Ky., to Martin, Tenn., with the intention of later extending it to Jackson, Tenn., and from there to Memphis, thus perfecting a superpower system covering the entire state.

Brief News Notes

Utica Gas & Electric to Take Over Clinton (N. Y.) Plant.—By a vote of 107 to 61 the citizens of Clinton, N. Y., decided on August 7 to sell the municipal lighting system to the Utica Gas & Electric Company.

Minnesota Power & Light Buys Park Rapids Plant.—The Minnesota Power & Light Company, Duluth, has purchased the Park Rapids hydro-electric plant and added it to the Little Falls-Cuyuna division, for which the Little Falls office is headquarters.

Electric Light Conference at Lawton, Okla., September 18.—The first of the district conferences to be held by the Electric Light and Power Division of the Oklahoma Utilities Association this year will be held at Lawton, Okla., September 18.

Utah Company Acquires New Idaho Plant.—The Utah Power & Light Company has purchased the power plant and property of the Warm Springs Power Company, formerly the Ashton & St. Anthony Power Company. This plant, which is near Ashton, Idaho, furnishes electric power and light service to several communities in the Snake River valley in Idaho.

Third Nipigon Unit Goes Into Commission.—The Ontario Hydro-Electric Power Commission has placed in operation the third unit in the Nipigon Hydro System, bringing the power capacity up to 37,500 hp. A fourth unit, increasing the power capacity to 50,000 hp., will be brought into operation early in September.

Asks State License for 110,000-Hp. Columbia River Project.—Application has been received by Marvin Chase, State Supervisor of Hydraulics at Olympia, Wash., from George Adams Shamberger of Oroville for permission to divert the entire flow of the Columbia River, with a dam site half a mile upstream from Starr. The proposed dam would be of concrete, 46 ft. high and 1,150 ft. long, and the project would, the application says, develop 110,000 hp., at a cost of between $4,000,000 and $5,000,000.

Engineer Employers and Recruits Meet at Chicago Forum.—Although no technical meetings are held by it in the summer, the Western Society of Engineers is filling a useful function at its Chicago headquarters by holding a "young mens forum" at regular intervals. To this engineering college students from all over the country are invited, and an opportunity is afforded them to talk over with the members of the society opportunities and conditions of employment. Inspection trips are made on occasion to plants with special engineering interest. The young men's forum is to continue during the winter and plans to hold two informal meetings a month.

Seattle Plans to Reduce Rates When Skagit Power Is Available.—A reduction of 10 per cent in Seattle's lighting rates for residences will be proposed in an ordinance to be introduced in the City Council as soon as electricity from the Skagit plant is available. Superintendent of Lighting J. D. Ross has tentatively outlined a reduction in rates for house lighting from 5½ to 5 cents a kilowatt-hour. The utilities committee of the Council has recommended also a decrease in power rates to industrial plants.

A North Carolina Rural Line.—Electric current has been supplied to the newly completed power line erected by the Providence Road Community, Inc., organized by North Carolina farmers to purchase energy from the Southern Public Utilities Company of Charlotte and resell it to subscribers. The line, which is connected with the city system on the edge of Myers Park, extends for five miles through the countryside. Directors of the company are now considering an extension of the line. It was erected at a cost of $8,000, which was subscribed in the form of stock issued to the Providence Road Community, Inc. The line serves fourteen subscribers, including a church and school, and is an example of the rural extensions being undertaken in the South.

New Service Station for New York Edison.—A new eight- and ten-story concrete service station for the New York Edison Company is in course of erection at Forty-first Street and First Avenue, New York. The first three floors will be devoted to garage requirements and have an unusual feature, made possible by the slope of the land, in that vehicles may enter any one of these floors from the street level. The First Avenue entrance leads to what is actually the third floor; midway down the Forty-first Street side is another entrance for vehicles, which leads directly to the second floor, while facing the East River, in the rear, is an entrance to the first floor. The United Electric Light & Power Company will occupy the eighth floor of the building.

Iowa Southern Utilities Absorbs Burlington Company.—Official confirmation of the purchase of the Burlington Railway & Light Company by the Iowa Southern Utilities Company has been made. With this acquisition the Iowa Southern Utilities, whose headquarters are in Centerville, will serve the three southern tiers of Iowa counties, with a total of about 35,000 patrons. Besides Burlington, twenty-four other communities are reached by the lines of the property just acquired. In the proposed franchise from Burlington the city is required to give nothing but the right to use its streets and alleys. There is no accompanying contract binding it to make use of any of the company's product for street or other public lighting, and liberal provisions are made for connections and extensions. The city reserves the right to regulate and fix rates.

Great Growth of Toronto's Hydro-Electric System.—The general expansion in the use of electric power for domestic and industrial purposes in Canada is strikingly exemplified in the growth of the Toronto Hydro-Electric system. In 1912 this system had 13,858 meters installed in that city. In 1922 this number had grown to 93,065. In that year the Hydro absorbed the Toronto & Niagara Power Company's system, which increased the number of meters to 122,872. In 1923 this had increased to 132,125. The number of additional street lamps installed was about 15,000. The kilowatt-hours sold increased from 35,176,548 in 1912 to 392,367,546 in 1923.

Progress in Eastern Tennessee.—The Tennessee Eastern Electric Company has completed a million-dollar program involving the construction of a new steam plant on the Watauga River near Johnson City, to be used as an auxiliary and supplemental steam plant to the company's hydro-electric system. The Tennessee Eastern Electric Company is also reconstructing its lines from its hydro plant on the Nollachucka River through Greeneville to Johnson City and has just finished a new line from Johnson City to the steam plant on the Watauga River, thus making connections with the Watauga Power Company at Elizabethton.

Texas Company May Build Big Plant in Lignite Fields.—It is announced that the Texas Power & Light Company of Dallas has an option on 1,400 acres of land situated near the town of Trinidad. The company is making investigation of the lignite beds underlying the tract of land. Should enough lignite coal be found to induce it to exercise the option, it will, according to the statement, build there the largest electric power plant in Texas. The Trinity River, lying on the west side of this tract, offers an abundant water supply. Sufficient lignite coal to furnish fuel for the plant for a period of more than one hundred years is thought to exist on the site.

Steel-Mill Motor Has 50-Ton Shaft.—At the Riverside plant of the Otis Steel Company, Cleveland, a new 40-in. blooming mill, operated entirely by electricity, was recently installed. The new mill is of the reversing type. For driving it a 600-volt direct-current motor, with a continuous rating of 6,500 hp. and a maximum momentary rating of 17,000 hp., is used. Speed ranges up to 120 revolutions per minute, either forward or reverse. The size and strength of the motor can be appreciated from the fact that the shaft alone weighs 50 tons. Power is derived from a motor-generator set consisting of a 3,000-hp. alternating-current induction motor driving two 2,700-kw., 600-volt direct-current generators.

Puget Sound Company Enlarges White River Plant.—The fourth hydro-electric unit at the White River plant of the Puget Sound Power & Light

Company, Seattle, will be put in service about November 1. The new unit will be of 23,000 hp. capacity and will increase the capacity of the plant to 84,662 hp. Water will be supplied to the turbine through a penstock extending 2,300 ft. from the end of the present pressure tunnel. The operating head at the plant is 440 ft. The cost of the construction will run to about $1,200,000.

Alameda's Disused Plant Helps Out Southern California Systems. — The 1,500-kw. steam plant of the city of Alameda, Cal., which had not been used since the city began to buy its power from the Great Western Power Company several years ago, has been started up again to supply power to the Southern California Edison Company for distribution in the southern part of the state, where the unprecedented drought has caused such a severe shortage of power. To get the power from the bay region it must pass over the lines of the Great Western Power Company, the Pacific Gas & Electric Company and the San Joaquin Light & Power Company to those of the Southern California Edison. For a time other northern communities were able to lend power to their southern neighbor, but the continued dry season has forced them to discontinue this assistance to attend to their own needs.

El Paso's New Lighting System.—El Paso, Tex., will be among the first cities in the Southwest to install a system of intensive "white way" illumination. Throughout the mile and a half of the business section there is to be illumination of between 450 and 500 lumens per foot of street, produced by 244 6.6-amp. General Electric luminous arcs with high-efficiency electrodes. These will be mounted two lamps to a standard, staggered along the curbing. Installation will be completed before November. The type of lighting unit was selected after a careful study had been made of all systems and after samples had been tried in the streets. The installation is being made by the property owners, and the system will be maintained by the El Paso Electric Railway Company at the expense of the city.

"World's Biggest" Lumber Plant Electrically Equipped.—What is said to be the largest lumber-manufacturing plant of its kind in the world, involving as a side issue the building of an industrial city, has just been started by the Long Bell Lumber Company on the Columbia River, 50 miles northwest of Portland, Ore. The mill, which can turn out 500,000 ft. of lumber in eight hours, is electrically driven throughout, being supplied with power from a hog-fuel steam plant adjacent to the main mill building. Three 6,000-kw. turbo-generator sets supply the mill, the town of Longview and the logging operations of the Long Bell Lumber Company at Ryderwood, 30 miles north, and there is space for three additional 6,000-kw. units, which are to be installed as needed. All the equipment in the generating station is of General Electric Company manufacture. Distribution for the mill is accomplished by 13,200-volt circuits carried underground to four substations. The plant machinery is driven by approximately 600 motors, nearly all the product of the Westinghouse Electric & Manufacturing Company, aggregating a total rated capacity of 16,344 hp. Distribution for Longview, which has already a population of 5,800, is accomplished by means of a 13,200-volt line carried to various substations placed in different districts of the city, thence by 2,200-volt distribution lines to the service transformers.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations is published in the first issue of each volume. See July 5 issue, page 50, for latest list.]

Conference of Electrical Leagues, Association Island, Henderson Harbor, N. Y., Sept. 2-6. Address Society for Electrical Development, 522 Fifth Avenue, New York.

Pennsylvania Electric Association—Bedford Springs Hotel, Bedford Springs, Pa., Sept. 3-6. H. M. Stine, 212 Locust St., Harrisburg.

Association of Edison Illuminating Companies—Griswold Hotel, New London, Conn., Sept. 8-12. P. S. Millar, 80th St. and East End Ave., New York.

Michigan Electric Light Association—Hotel Statler, Detroit, Sept. 9-11. Herbert Silvester, Edison Bldg., Ann Arbor, Mich.

New England Division, N. E. L. A.—Hotel Wentworth, Portsmouth, N. H., Sept. 10-13. Miss O. A. Bursiel, 149 Tremont St., Boston.

Rocky Mountain Division, N. E. L. A.—Hotel Colorado, Glenwood Springs, Col., Sept. 15-17. O. A. Weller, 900 15th St., Denver.

Colorado Public Service Association—Hotel Colorado, Glenwood Springs, Col., Sept. 15-17. J. F. Greenawalt, Mountain States Telephone & Telegraph Company, Denver.

Southeastern Division, N. E. L. A.—Birmingham, Sept. 15-18. E. T. O'Connell, Alabama Power Co., Birmingham.

Association of Iron and Steel Electrical Engineers—Duquesne Garden, Pittsburgh, Sept. 15-20. J. F. Kelly, 513 Empire Building, Pittsburgh.

Great Lakes Division, N. E. L. A.—French Lick, Ind., Sept. 24-27. R. V. Prather, Illinois Mine Workers' Bldg., Springfield, Ill.

Electrical Supply Jobbers' Association, Pacific Division—Del Monte (Del Monte Lodge, Pebble Beach), Cal., Sept. 25-27. Albert H. Elliot, 502 Flatiron Bldg., San Francisco.

Safety Congress, National Safety Council — Hotels Brown and Seelbach, Louisville, September 29-October 3.

Association of Electragists International—West Baden Springs, Ind., Sept. 29-Oct. 4. L. W. Davis, 15 W. 37th St., New York.

American Electrochemical Society — Hotel Fuller, Detroit, Oct. 2-4. Colin G. Fink, Columbia University, New York.

American Electric Railway Association—Atlantic City, N. J., Oct. 6-10. J. W. Welsh, 8 West 40th St., New York.

Empire State Gas and Electric Association—Lake Placid Club, N. Y., Oct. 6-7. C. H. B. Chapin, Grand Central Terminal, New York.

American Institute of Electrical Engineers—Pacific Coast convention, Pasadena, Cal., Oct. 13-17. F. L. Hutchinson, 33 West 39th St., New York.

International Association of Municipal Electricians—Partridge Inn, Atlanta, Oct. 14-17. W. R. Arbuckle, Bayonne, N. J.

Electric Power Club—Greenbriar Hotel, White Sulphur Springs, W. Va., Oct. 20-23. S. N. Clarkson, B. F. Keith Bldg., Cleveland.

Kansas Public Service Association—Broadview Hotel, Emporia, Kan., Oct. 24-25. R. T. Smalley, Kansas Electric Power Co., Emporia.

Illuminating Engineering Society, Briarcliff Manor, N. Y., Oct. 27-31. N. D. Macdonald, 29 West 39th St., New York.

Hydro-Electric Progress in the Dutch East Indies.—Good progress is being made with the establishment of a hydro-electric plant to utilize the water power of the River Mamasa in the central west district of Celebes, one of the Dutch East Indian islands. At a distance of only from 7½ to 11½ miles from the seacoast the river is nearly 20,000 ft. above sea level and it comprises numerous falls, the principal one, known as the Garoegoe, being 1,935 ft. in height. It is estimated that 180,000 hp. can be delivered during ten months of the year to the turbine shafts, the minimum for the remaining two months being 120,000 hp. At present it is only proposed to install plant to the extent of 100,000 hp. at the power station, which is to be built on the banks of another river, the Todkan, about 5 miles from its outlet into the sea. The plant is being put down on behalf of a syndicate which will utilize the power for the production of nitrate manures on a large scale.

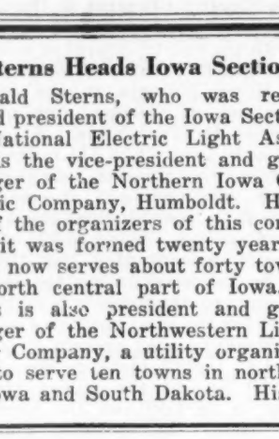
Continued Electrical Growth in Michigan.—Evidences of continued utility activity in the construction field come from Michigan, where generating stations are being extended or rehabilitated, transmission lines and high-voltage substations built and distribution lines laid out to anticipate the industrial growth of the state. Some of the projects under way last spring were noted in the "Briefer News" of April 12. Work has now been started by the Detroit Edison Company on a new 30,000-kw., 120,000-volt outdoor substation at Monroe. Power will be taken from the 120,000-volt transmission line which will connect all the plants of the company. At a cost of about $250,000 the Menominee & Marinette Light & Traction Company has just completed improvements at the Ingalls power plant undertaken two years ago. A large turbine and substation, seven new floodgates and a larger tailrace are among the additions. With an estimated expenditure of $35,000 the Great Lakes Power Company is building a new penstock and power house on the Cass River, near Caro, in which town the lines are being rebuilt. The company expects to extend other lines and complete a loop to insure still more reliable service. Many farmers will probably be served from this power line. Further reports of substitution of central-station service for municipal plants come from the Consumers Power Company, the Michigan Gas & Electric Company and the Detroit Edison Company. The Ludington station of the Michigan United Light & Power Company, referred to in the former note, is finished, ranking as one of the largest power plants in the western part of the state. A fine office building has just been completed by the Detroit Edison Company in Mount Clemens, the structure being of Spanish design.

Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men Engaged in All Branches of the Electrical Industry

Sterns Heads Iowa Section

Donald Sterns, who was recently elected president of the Iowa Section of the National Electric Light Association, is the vice-president and general manager of the Northern Iowa Gas & Electric Company, Humboldt. He was one of the organizers of this company when it was formed twenty years ago, and it now serves about forty towns in the north central part of Iowa. Mr. Sterns is also president and general manager of the Northwestern Light & Power Company, a utility organized in 1924 to serve ten towns in northwestern Iowa and South Dakota. His election to the presidency of the Iowa Section was the natural result of his active participation in its affairs for many years.



DONALD STERNS

E. T. Pace, formerly an assistant to the superintendent of distribution and installation for the Virginia Railway & Power Company in Richmond, Va., has been appointed superintendent of distribution.

Gray H. Bernard, formerly a supervisor of one of the plants of the Remy Electric Company, Anderson, Ind., has been transferred to the sales division with headquarters in Detroit.

C. A. Mullen, formerly connected with the Ohio Service Company, Coshocton, Ohio, is now identified with the Pennsylvania Power & Light Company at Hazelton, Pa.

E. R. Godfrey, who has been connected with the Remy Electric Company's plant at Anderson, Ind., for a number of years as a supervisor and in other capacities, has been named as the new supervisor of Remy Electric plant No. 2 to succeed Gray H. Bernard, who has been transferred to the sales division of the company.

William Gowdy, formerly general superintendent of the Binghamton (N. Y.) Light, Heat & Power Company, has been promoted to the office of general manager. Roy L. Peterman, who was formerly vice-president and general manager, will continue in the office of vice-president.

A. P. Holt of London, England, has been elected a director of the Brazilian Traction, Light & Power Company.

Harold I. Shakeshaft has been appointed general superintendent of the Binghamton (N. Y.) Light, Heat & Power Company and assistant to William Gowdy, who has been promoted from the office of general superintendent to that of general manager.

A. B. Sanborn has been appointed general manager of the East Kootenay Power Company, Ltd., Fernie, B. C., the controlling interest of which was recently acquired by the investment house of Nesbitt, Thomson & Company, Montreal.

Owen D. Young, chairman of the board of the General Electric Company, has, it is announced from Europe, agreed to serve temporarily as agent general of the Reparations Commission in putting the Dawes plan into effect if this plan shall be finally ratified by Germany as well as by the other countries concerned. Mr. Young was, it will be remembered, indicated by the British and French Premiers early in the conferences as in their view the right man for this post. He is, however, understood to have stipulated that his part must be confined to getting the plan on its feet, after which his duty to his company will necessitate the turning over of the agency general to another.

Stanley J. Wallace, who has been connected with the Conneautville (Pa.) plant of the Burke Electric Company, Erie, for the past year and a half, has been appointed superintendent of that plant, succeeding Byron L. Ferguson, deceased.

J. W. Keeney, who has been acting superintendent of production in charge of all power stations, substations and transmission lines for the Virginia Railway & Power Company, Richmond, Va., was recently officially named to this position.

Berryman T. Longino, who has been superintendent of the railway department of the Columbus (Ga.) Electric & Power Company for the past four and a half years, has been appointed general superintendent of the Eastern Texas Electric Company, Beaumont. Both these properties are managed by Stone & Webster.

Washington Devereux, chief of the electrical department of the Philadelphia Fire Underwriters' Association, his many friends in the electrical industry will be glad to know, is well on the road to recovery. Mr. Devereux became ill last January and was forced to relinquish temporarily the duties of his office, to which he will return within a few weeks.

W. B. Miser has recently become commercial manager of the Emporia division of the Kansas Electric Power Company. Mr. Miser, who is a graduate of the electrical engineering school at Purdue University, has at various times served as branch manager with the Westinghouse Electric & Manufacturing Company, operating manager and later general sales manager of the Illinois Traction Company. More recently he has been identified with the Oklahoma Gas & Electric Company at Drumright.

J. B. Ledlie Appointed Superintendent in Las Cruces

J. B. Ledlie, who for several years has been sales manager of the El Paso (Tex.) Electric Railway Company, has been appointed superintendent of the Mesilla Valley Electric Company, formerly the Las Cruces Electric Light & Ice Company, Las Cruces, N. M., this property having recently been acquired by Stone & Webster.

J. B. LEDLIE

Before going with the El Paso company Mr. Ledlie was electrical engineer of the Northern Texas Traction Company of Fort Worth, having risen to that position by successive stages.

Obituary

F. A. Bryan, formerly president and general manager of the Indiana & Michigan Electric Company, South Bend, Ind., died on July 23. Mr. Bryan was not connected with the South Bend utility at the time of his death, having resigned in the spring of 1923 after completing twenty-two years of service with the company.

Edward L. Donan, manager of the Stuttgart, (Ark.) division of the Arkansas Light & Power Company, died suddenly August 12 as the result of an electric shock received when he came in contact with a live wire while supervising reconstruction work. Mr. Donan was a native of St. Louis and a graduate of De Pauw University. He was twenty-six years of age.

Financial and Corporate

Utility Market Better

Commonwealth Power Corporation Is a Leader as the List Shows Improvement

AS AUGUST draws toward an end the market in power and light stocks appears to be developing greater strength, and certainly trading is becoming more brisk. Doubtless the continued ease in money rates and the general tendency of investors to turn more and more to the utilities markets has had something to do with this improvement, but the seasonal factor is likewise one to be reckoned with. One of the more interesting situations again last week was the fact that the American Power & Light Company's common shares continued their forward movement to new high levels, actual sales having been made as high as 425.

While buying of power and light bonds continues good and prices remain firm or better than firm, the greatest interest last week was in the advances of the stock list. Numerous noteworthy rallies appeared, but as usual there were market favorites and in them the sharpest gains came. Commonwealth Power Corporation common shares, after rising several points to par two weeks ago, staged an even more impressive rally last week. Sales of stock were made as high as 110½. This company is earning at the rate of $12 or $13 per share on the common stock after allowances for depreciation, and, if reports are borne out, will show better earnings during the fall months this year. Increased interest in the stock comes from the improving earning position of the corporation and from the expectation that the time is near at hand when the dividend rate will be increased. The stock, which last week touched 110½, could have been bought earlier in 1924 at 39½.

While trading in them was not so lively, two higher-priced issues made greater gains for the week than did Commonwealth. These issues were National Power & Light, which rallied very close to twenty points at one time, and Carolina Power & Light, which was up thirty-five points at one time. Other gainers for the week were American Gas & Electric Company shares and the common shares of such utilities as Lehigh Power Securities, Cities Service, Mississippi River Power, Tennessee Electric Power and Alabama Traction, Light & Power. The Northern Ohio issues, on the other hand, showed a tendency toward weakness.

Public Utility Financing Meager in Past Week

The week ended August 26 was dull and uninteresting as far as offerings of electric light and power securities were concerned, the only sizable issue being the offering of gold bonds of the Pacific Gas & Electric Company amounting to $12,500,000. The bonds were priced at 98 and accrued interest, yielding about 5.65 per cent. The proceeds will be used for improvements and extensions. The Missouri Power & Light Company offered an issue of $1,200,000 in first mortgage gold bonds at 98½ and accrued interest, yielding over 6.60 per cent. This issue of bonds was for the purpose of acquiring the properties of the North Missouri Power Company, the securities of the Marysville Water & Electric Company, for other property additions and for the retirement of underlying bonds. The New Orleans Public Service, Inc., offered $1,650,000 in general lien gold bonds, the price being 86½ and interest and the yield about 6.25 per cent. Fifteen thousand shares of 7 per cent cumulative preference stock, series A, of the Toledo Edison Company were placed on public sale during the week at $98 per share and accrued dividends, to yield 7.14 per cent.

American Water Works & Electric Company Earnings

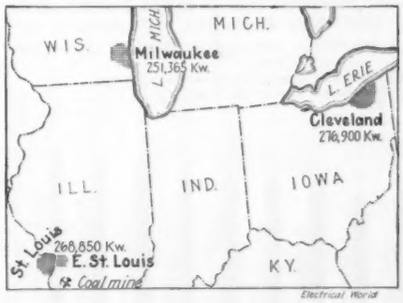
The American Water Works & Electric Company, Inc., reported net earnings for the year ended June 30, 1924, of $3,093,544.55, equivalent after depreciation and first preferred dividends to $12.30 a share on both the 100,000 shares of common and 100,000 shares of participating preferred now outstanding. This compares with a net for the previous year of $2,621,284.55, or $10.63 a share, on the same amount of common and participating preferred then outstanding after depreciation and first preferred dividends.

North American Company's Compactness

This Veteran Utility Is the Largest in the Country Among Those Serving More than One State, and Its Business Is Concentrated in Big Cities

BY PAUL WILLARD GARRETT

THERE is fascination in a study of the growth made by particular companies over a period of years, but for persons with an investment bent probably there is more real instruction in a study of the manner of growth. After all, size is not so much in itself. If to gain size a power and light company must reach out into the highways and byways, extending expensive transmission lines to places of doubtful promise, better far that it remain small. Our engineers are now pretty well convinced that, other things being equal, the greatest profits lie where holding companies can accumulate their properties with an eye for compactness. Such designs cannot always be worked out, but the idea is a good one to bear in mind, and there is a thought in it for investors who are attempting to pick sound securities.



LOCATION OF IMPORTANT SUBSIDIARIES OF THE NORTH AMERICAN COMPANY

Organized in 1890 as one of our earliest utilities of its kind, the North American Company surely presents a fascinating study in growth. Slowly at first and by leaps and bounds more recently, its operating subsidiaries have moved to the forefront. The North American Company is a holding company, of course, but its branches a year ago had an installed capacity of 640,115 kw. Since then the capacity has been raised to 785,115 kw., a total which tops that for any other company in this country doing business in more than one state. Still the North American Company continues to grow. The Cahokia plant on the Mississippi will turn in an additional 30,000 kw. immediately and another 35,000 kw. within a few months. The "Lakeside" plant on Lake Michigan will turn in another 30,000 kw. this fall. The North American Company operating subsidiaries will enter the new year thus with an installed capacity about 95,000 kw. more than at the present time, raising the total capacity from 785,115 kw. to 830,115 kw. That is getting into large figures.

A HAPPY COMBINATION

Altogether, the North American group represents the largest power and light organization in the country of its particular kind, but something other than size is what gives it great distinction. It is compactness. The business is not scattered here and there in numerous states. It is pretty much concentrated in three large cities and the adjoining sections, and these happen to be three of our large industrial centers. They are Cleveland, St. Louis and Milwaukee. As will appear from the map, the ventures of the North American Company almost all center at these points, which are about equally important. The Cleveland Electric Illuminating Company serves Cleveland, the Union Electric Light & Power Company serves St. Louis, and the Milwaukee Electric Railway & Light Company serves Milwaukee. These are three compact groups. Any one of the three is larger than the ordinary power and light company. To

get business the management does not need to build long and expensive transmission lines out into the smaller places. The North American group occupies a unique position for its advantages from the standpoint of compactness, and, having size too, the combination is a happy one.

MAKING THE PROPERTIES STRONG

For years the various operating companies under supervision of the North American Company management have been improving in earning position and have been plowing earnings back into the plant. Gross earnings for 1923 reached a new record high at $75,465,267 and net earnings reached $9,385,458, also a new high figure. A large proportion of the company's net earnings, 78.36 per cent, was derived from the electric light and power services. Railways in 1923 contributed 13.07 per cent of the net, gas and heating 5.08 per cent, coal properties 3.16 per cent and miscellaneous services 0.33 per cent. While the St. Louis railway property still is in receivership, the company has written off that loss and now carries the investment at a dollar. The other tractions are earners. The North American Company has an interesting and valuable investment in the West Kentucky Coal Company, a company which operates 22 mines and is the largest concern of its kind in the West Kentucky field.

In the fact that it has so consistently put money back into the property, rather than paying it all out in the form of cash dividends during past years, lies the secret of North American's success as much as anything. Since January 1, 1911, the reserves and surplus have been increased $54,064,610, or the equivalent of $19.91 per share for all common stock outstanding now. Indeed, since about a year ago the reserves and surplus have been increased approximately $11,000,000.

IS FREE FROM FUNDED DEBT

While its operating subsidiaries have debts, of course, the North American Company is one of the few large holding organizations of its kind that does not have a dollar of funded debt. The accumulation and use of large reserves and surplus have enabled it to maintain an uncommonly low ratio of capitalization to earnings. On December 31, 1922, the total capitalization of the company and its subsidiaries was $3.05 per dollar of gross earnings of the subsidiaries for the year, and satisfaction was taken over the matter in the annual report. But the showing for December '31, 1923, was even better, the ratio having been reduced by then to $2.94 per dollar of gross earnings.

North American Company preferred and common shares, both listed on the New York Stock Exchange, have, since there are no bonds, a pretty good investment position. The company has $29,085,750 of preferred stock outstanding, counting a ten-million-dollar issue offered last week. The amount available for preferred dividends in the twelve months ended June 30, 1924, totaled $8,833,543, or enough to cover requirements more than five times on all preferred stock outstanding plus the new stock presently to be outstanding. Something of the attractive quality of these preferred shares should be indicated by the fact that the issue is followed by common stock which, on the basis of prevailing quotations, represents a market equity of about $80,000,000.

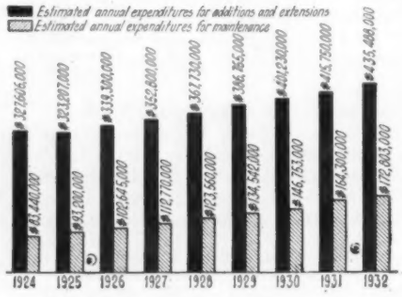
It was not until August 26, 1921, when the directors really took their first step toward redivision of the shares, that the great rise in common stock values began. The stock on that day was selling at 64. A hundred shares would have cost $6,400. For the man who bought a hundred shares on that day and who has exercised all of his subsequent rights, requiring additional payments of $3,500, the North American common shares have made a small fortune. An original investment of $6,400 plus $3,500, or $9,900, has been swelled to $32,222. The larger value represents stock received in exchange for the original shares plus stock dividends and does not take account of $2,070.50 received in the former cash dividends. This represents a rise in investment values that must thrill even the speculatively minded.

Engineering and Finance

Relation of the Dollar to Present-Day Plant Expenditure and How It Differs from the Past

BY S. D. SPRONG
General Manager Orange County Public Service Company

THE major portion of present-day capital expenditures in public utilities is for plant and equipment and therefore controlled or largely influenced by the engineering departments of the companies. It is, consequently, obligatory on the part of the engineer to give most careful thought to his plans, and in terms of "dollars." The relation of the dollar to present-day plant expenditures has a much greater perspective than in the past owing to the fact that equipment now to be installed has a much longer useful life than formerly. Therefore, as the probable economic life of the new



LARGE SUMS WILL BE SPENT DURING THE NEXT FEW YEARS FOR MAINTENANCE AS WELL AS FOR ADDITIONS TO CENTRAL-STATION SYSTEMS

plant is greater, so must the vision and perspective of the engineer be correspondingly greater in his plans and their relation to further developments during the latter part of its useful life.

For many years during the earlier period of the utility industry the evolutions in the art were so rapid that whatever equipment representing current design and production might be purchased was very likely to be superseded and become obsolete for economic reasons in the relatively near future, even though its actual operating life had hardly begun. For this reason it was improbable that any lasting error of judgment or location would be made, even though little study was given to the broader features of the plant.

However, during recent years there has been a rapidly increasing standardization in many of the principal elements of utility equipment, from which it naturally follows that until there is a radical, though improbable, change in the art, apparatus recently installed and contracted for will be expected to function for a much greater period of its possible operating life than formerly. From this it naturally follows that a very thorough and critical study should be given to all important capital expenditures for plant and equipment so as to insure its remaining an economical and component part of the property as a whole as it is added from time to time in the future.

Dividends Declared

The following quarterly dividends were announced by central station companies and electrical manufacturing companies during the seven-day period ended August 26:

Name of Company	Per Cent	When Payable
Associated Gas & Electric, pf. (ext.)	12½c	April 1*
Associated Gas & Electric, pf. (ext.)	12½c	July 1*
Associated Gas & Electric, pf. (ext.)	12½c	Oct. 1*
Associated Gas & Electric, pf. (ext.)	12½c.	Jan. 1†
Blackstone Valley Gas & Electric	$1.25	Sept. 2
Cities Service, com. (monthly in cash scrip)	½*	Oct. 1
Cities Service, com. (monthly in com. stock scrip)	1½†	Oct. 1
Cities Service, pf. (monthly)	½	Oct. 1
Cities Service, pref. B (monthly)	½	Oct. 1
Dubuque Electric, pf.	1¾	Sept. 1
Galveston-Houston Electric, pf. (semi-annual)	$3	Sept. 15
Grafton County Electric Light & Power, pf.	2	Sept. 2
Laclede Gas Light	1¾	Sept. 15
Mascoma Light & Power, com.	1¾	Sept. 2
Mascoma Light & Power, pf.	1¾	Sept. 2
Middle West Utilities, prior lien	$1.75	Sept. 15
National Power & Light, com.	$1.50	Sept. 1
National Power & Light, pf.	$1.75	Oct. 1
Niagara Falls Power, com.	.50c.	Sept. 15
Niagara Falls Power, pf.	.43¾c.	Oct. 15
Northern States Power (Wis.) pf.	1¾	Sept. 2
Southern Colorado Power, pf.	1¾	Sept. 15
American Copper Products, com.	50c.	Sept. 1
American Copper Products, pf.	1¾	Oct. 1
Crane Company, com.	1¼	Sept. 15
Crane Company, com. (payable in common stock)	10	Sept. 20
Crane Company, pf.	1¾	Sept. 15
Fulton Iron Works, pf.	2	Sept. 9
Gamewell Company, com.	$1.25	Sept. 15
Gamewell Company, pf.	1¾	Sept. 1
General Electric, com.	2	Oct. 15
General Electric, com. (payable in special stock)	5	Oct. 15
General Electric, special	15c.	Oct. 15
Niles-Bement-Pond Co., pf.	1¾	Aug. 30
Radio Corporation of America, pf.	1¾	Oct. 1

*1925. †1926.

Company Reports

Among the company reports issued during the past week for the month of July are the following:

Name of Company	Gross Revenues for July, 1924	July, 1923
Alabama Power	$676,410	$620,045
Cities Service	1,320,696	1,296,673
Commonwealth Power	2,245,868	2,232,836
Detroit Edison*	2,418,787	2,235,359
East Penn Electric	254,128	227,078
Kansas City Power & Light	677,682	634,211
Massachusetts Lighting Co.'s	253,604	259,217
Republic Railway & Light	783,548	792,131
Utah Securities†	873,420	791,375
Virginia Railway & Power	828,814	857,514
Washington Water Power	421,123	403,852

*Includes operating and non-operating revenue. †Earnings of subsidiaries.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par value of stocks is $100.)

Companies	Bid Price Saturday, Aug. 23	Low 1924	High 1924
PREFERRED STOCKS			
Operating Companies			
Adirondack Power & Light 7 per cent	95	94	97¾
Appalachian Power, 7 per cent	88	85½	90
Arkansas Light & Power 7 per cent	90	81	93
Asheville Power & Light 7 per cent	96	96	99
Carolina Power & Light 7 per cent	98	95½	100
Central Illinois Public Service 6 per cent	84	84	87
Colorado Power 7 per cent	93	90	97
Connecticut Light & Power 7 per cent	99	99	102
Consumers' Power 6 per cent	89	85	93
Dayton Power & Light 6 per cent	84	84	90
Duquesne Light 7 per cent	a 107½	102	108
Eastern Texas Electric 6 per cent	95	81	95
Empire District Electric 6 per cent	73	70	78
‡ Erie Lighting	a 28½	23½	30
Fort Worth Power & Light 7 per cent	97	97	100
Great Western Power 7 per cent	98	96	98
Illinois Northern Utilities 6 per cent	82	82	87
Illinois Power & Light 7 per cent	92½	84	95
Kansas Gas & Electric 7 per cent	93	92	97
Long Island Light 7 per cent	98	95	98
Minnesota Power & Light 6 per cent	85	78	87
Mississippi River Power 6 per cent	87	80	90
Nebraska Power 7 per cent	94½	89	99
Niagara Falls Power 7 per cent—25	a 28½	27	28½
Niagara, Lockport & Ont. Power 7 per cent	101	99½	104½
Northern States Power 7 per cent	94	91	97
Ohio Public Service 7 per cent	92	86	94½
Pacific Gas & Electric 6 per cent	90	85½	92¼
Penn-Ohio Power & Light 7 per cent	90½	84	96½
Pennsylvania Power & Light $7—no par	98	93	99
Penn. Public Service 7 per cent	90	90	100
‡Philadelphia Electric 8 per cent—25	38½	29¾	39¾
Southern California Edison 8 per cent	115	112	119
Tennessee Electric Power, 6 per cent	78	71	81
Texas Power & Light 7 per cent	95	95	96½
Utah Power & Light 7 per cent	95½	94	96½
Western States Gas & Electric 7 per cent	78	78	85
Yadkin River Power, 7 per cent	96	94	96½
Holding Companies			
American Gas & Electric 6 per cent—50	44	41½	46
American Light & Traction	91	91	94½
American Power & Light 6 per cent	90	84	91
American Public Service 7 per cent	84	84	88
American Public Utilities 7 per cent	79	73	85
American Water Works & Electric 6 per cent	a 91½	66	99
Carolina Power & Light 7 per cent	98	95½	99
Central Indiana Power 7 per cent	84	80	90
Cities Service 6 per cent	74	67	75
Commonwealth Power	a 78½	72	82
Consolidated Gas 6 per cent—50	58½	51	59½
Continental Gas & Electric 7 per cent	85	69	90
Electric Bond & Share 6 per cent	101	96½	103
General Gas & Electric—$8—no par	101	96	101½
Middle West Utilities 6 per cent	88	80	90
National Power & Light—$7—no par	91½	84	96½
North American 6 per cent—50	49½	43¾	50¾
Northern Ohio Electric	a 27	16	34
Public Service Corp. of N. J. 7 per cent	99	96½	100
Public Service Corp. of N. J. 8 per cent	108	99½	108½
Standard Gas & Electric 8 per cent—50	49½	46½	49½
‡United Gas Improvement—50	a 57½	55½	58
United Light & Power—$6.50—no par	79	75¾	80
COMMON STOCKS			
Operating Companies			
Adirondack Power & Light—50	33½	22½	34
Appalachian Power—no par	72½	66½	93
Arkansas Light & Power	60	22	63
Brooklyn Edison	a 114	107½	117¾
Buffalo General Electric	145	118	150
Carolina Power & Light	180	82½	180
Colorado Power	33	21	35
Commonwealth Edison	126	126	135
§Consolidated Gas, Electric Light & Power	a 117	113	117
Dayton Power & Light	115	70	120
Detroit Edison	a 108½	102½	110½
|| Edison Electric Illuminating of Boston	a 188	163½	190
*Kentucky Hydro-Electric	87½	85½	87½
Long Island Lighting	175	100	185
Mississippi River Power	32	18½	32½
Montana Power	68¾	61½	71
Niagara Falls Power—no par	42	45	48
Niagara, Lockport & Ontario Power—no par	53	45	59
Northern Ohio Electric—no par	10	5	16
Northern States Power	99	92	106
North Texas Electric	61	58	84
Pacific Gas & Electric	a 95	90½	96½
‡Penn Central Light & Power—no par	59½	57	60
Pennsylvania Water & Power	107	98½	110
‡Philadelphia Electric—25	a 38½	29	39¾
Public Service Co. of Northern Illinois	97	97	104
Puget Sound Power & Light	57	43½	61½
Southern California Edison	97	95	106
Tampa Electric	a 162	134	162
Tennessee Electric Power—no par	39	20	40½
Virginia Power	45	16	60
Virginia Railway & Power	a 68½	36	72¾
West Penn. Co.	a 89	47½	98

Companies	Bid Price Saturday, Aug. 23	Low 1924	High 1924
Holding Companies			
‡American Electric Power—50	62	22½	62½
American Gas & Electric—no par	82½	43½	82½
American Light & Traction	125	115	140½
American Power & Light (old)	408	220	408
American Power & Light (new)	41½	34½	41½
American Public Utilities	83	35	85
American Water Works & Electric	a117½	40	120
Carolina Power & Light—no par	185	103	185
Cities Service	143	140	155
Columbia Gas & Electric—no par	a 39½	33	42¾
Commonwealth Power Corp.—no par	108	56	108
Consolidated Gas—no par	a 70¾	60¾	72¾
Continental Gas & Electric	68	49	72
Federal Light and Traction	79	70	83
General Gas & Electric	54	22	55
Lehigh Power Securities—no par	80½	31	81½
Middle West Utilities—no par	58½	41	60
National Power & Light—no par	166	60	171
Philadelphia Co.—50	a 49½	42½	53½
Power Securities—no par	12	4	14
Public Service Corp. of N. J.—no par	a 59¾	39	59¾
Standard Gas & Electric—no par	a 35¾	31½	37¾
United Gas & Electric (Conn.)—no par	33	14	42
Utah Securities	a 30½	16½	32½
BONDS			
Operating Companies			
Adirondack Power & Light 6s 1950	102¾	97½	102¾
Alabama Power 5s 1946	95½	90½	96
Appalachian Power 5s 1941	100½	89	94½
Brooklyn Edison 5s 1949	a 100¾	97½	102½
6s 1930	a 105	102½	106
7s 1940	a 109	107	110
Central Indiana Power 6s 1947	93	88	95
Cleveland Electric Illuminating 5s 1939	100	98½	100½
Commonwealth Edison 5s 1943	99½	95	100
5s 1953	a 98½	92	99½
§Consol. Gas, Elec. Lt. & Pwr. 4½s 1935	95½	91½	95½
6s 1949	104½	101½	105
6½s 1951	108½	107	108½
Consumers' Power 5s 1936	98½	94¾	99½
5s 1952	a 89¾	87	92¾
Detroit Edison 5s 1933	99¾	99¾	101
Duquesne Light 6s 1949	a105	103½	106½
Great Western Power 5s 1946	95	90½	96
Kansas City Power & Light 5s 1952	a 93	89	95½
Mississippi River Power 5s 1951	96½	92	97
Montana Power 5s 1943	a 97½	95	98
New England Power 5s 1951	98½	97	100
New York Edison 6½s 1941	a112½	109¾	112¾
Niagara Falls Power 6s 1950	105	104	105½
Northern States Power 5s 1941	a 93½	89½	94
6s 1941	a103½	101	104
Ohio Power 7s 1951	106	103	106½
Pacific Gas & Electric 5s 1942	a 94	90¾	95
Pennsylvania Water & Power 5s 1940	99	96	99½
‡Philadelphia Electric 5s 1966	a 103½	97	105½
5½s 1947	a 103¾	99½	103½
6s 1941	106½	103¾	106½
Portland Electric Power 6s 1947	94	89¾	95½
Southern California Edison 5s 1939	98½	96	99
6s 1944	102½	100	103½
Tennessee Electric Power 6s 1947	97½	93½	98½
Texas Power & Light 5s 1937	95	91½	95
Toledo Edison 7s 1941	a 108½	106	109
Utah Power & Light 5s 1944	a 91½	87½	93½
Holding Companies			
Alabama Traction, Light & Power 5s 1962	81	65½	82
American Gas & Electric 6s 2014	95½	94	95¾
American Power & Light 6s 2016	94½	91	94½
Amer. Water Works & Electric 5s 1934	a 91½	84½	94
Commonwealth Power 6s 1947	a 96½	87	96½
Consolidated Cities Lt., Pwr. & Tr. 5s 1962	73	64	74
Illinois Power & Light 6s 1953	99½	95	100½
United Light & Railways 5s 1932	93½	87½	93½
6s 1952	96	92	96
ELECTRICAL MANUFACTURING COMPANIES			
PREFERRED STOCKS			
Allis-Chalmers Manufacturing	100½	90	100½
*National Carbon	122	115	125
Worthington Pump & Machinery	a 78½	68	78½
COMMON STOCKS			
Allis-Chalmers Manufacturing	a 62½	41½	66½
American Bosch Magneto—no par	30½	22½	38½
Electric Storage Battery—no par	a 57½	50½	64
General Electric	a 274	193½	281
General Electric—10	11½	10½	11½
*Hurley Machine—no par	a 56	48	59½
†Wagner Electric	25½	20	34½
Westinghouse Electric & Manufacturing—50	a 62½	55½	65
Worthington Pump & Machinery	a 28	23½	31½
BONDS			
Canada General Electric 6s 1942	a 106½	102½	106½
General Electric 3½s 1942	83	80	83½
5s 1952	a 104½	100	104½
Robbins & Myers 7s 1952	77	75½	91½
†Wagner Electric Manufacturing 7s	100½	97	100½
Western Electric 5s 1944	a 98½	96	98¾
Westinghouse Electric & Mfg. 7s 1931	a 108½	106¾	109½

*Chicago Stock Exchange. †St. Louis Stock Exchange. ‡Philadelphia Stock Exchange. || Boston Stock Exchange. § Baltimore Stock Exchange.
a Bid price Tuesday, Aug. 26.

New Utility Manual

A new seventy-five-page volume, "A Study of Power and Light Investments," was issued during the past week by Bonbright & Company, investment bankers of New York City. This valuable contribution to the financial literature of the industry has two distinct divisions. The first is an analysis in textual form of facts which affect the property of every electric light and power company. The second is devoted to a statistical analysis of eighty-four American power and light companies which in 1923 had gross revenues of $1,500,000 or more and derived at least 80 per cent of their revenue from the sale of electrical energy. The book contains a generous amount of supplemental information on the industry, and altogether the new volume is one which will be kept as a convenient manual on the larger power and light companies by operating heads and bankers as well as by the investor for whom it is primarily intended.

Columbus (Ohio) Municipal Plant.—The municipal electric light plant of the city of Columbus, Ohio, reports net cash receipts for sales of current during 1923 totaling $221,470 and net cash expenditures for the maintenance and operation of the plant amounting to $81,605.

West Penn Customer Ownership.—The Monongahela West Penn Public Service Company, a subsidiary of the West Penn Company, on July 7 offered for sale to the employees and customers of the West Penn system $500,000 par value of its 7 per cent cumulative preferred stock. By July 26 this offering had been oversubscribed. The average purchase per subscriber averaged slightly over $300 par value. Since 1919 to date the subsidiaries of the West Penn Company have sold to customers and employees over $14,000,000 par value of preferred stocks through approximately 20,000 individual sales. The average purchase per individual during this period aggregated about $700 par value.

Niagara Falls Power Net Gains Over 1923.—For the quarter ended June 30, 1924, the Niagara Falls Power Company reports a net income of $654,455 after deduction of all expenses and charges, as compared with a net income of $589,680 for a similar period of 1923 and a net income of $723,323 in the March, 1924, quarter. The combined income account of the Niagara Falls Power Company, the Canadian Niagara Power Company and the Niagara Junction Railway Company shows the above net income figures for the June, 1924, quarter.

Montreal Tramway & Power Enters Suits.—The Montreal Tramway & Power Company has entered in the Superior Court three suits against the Quebec-New England Hydro Electric Corporation amounting to $643,915. The first is for $542,500 to recover sale price of certain securities said to have been sold and delivered by the plaintiff to the defendant; a second amount is for $55,443 to recover the amount of a certain promissory note said to be signed by the defendant in favor of the plaintiff, and a third is for the sum of $45,972 to recover interest on coupons said to be payable by the defendant and also certain sums of money said to have been advanced by the Montreal Tramway & Power Company to the defendant.

Binghamton (N. Y.) Company Seeks to Buy Afton-Windsor Utility.—The Binghamton Light, Heat & Power Company has made application to the Public Service Commission for the necessary authority to acquire all of the capital stock of the Afton-Windsor Light, Heat & Power Company, operating in Broome and Chenango Counties.

Barcelona Company Increases Capitalization.—The Barcelona Traction, Light & Power Company has increased its capitalization through the issuance of $17,500,000 non-cumulative participating 7 per cent preference stock. At the same time the reduction of the par value of the common stock from $100 to $50 brings the total par value of the capital stock to $45,000,000.

Southern Power & Light Company Offers Stock Exchange.—The Southern Power & Light Company has offered its common stock for exchange with the common stock of the Arkansas Light & Power Company on the basis of two shares for each share of the Arkansas company. The Southern Power & Light owns more than 80 per cent of the common stock outstanding of the Arkansas Light & Power Company.

Indiana Utility Submits Exchange Plan to Commission.—A petition has been filed by the Northern Indiana Gas & Electric Company with the Indiana Public Service Commission asking for permission to change its financial structure by retiring its class B preferred stock of $100 par value and its common stock of $100 par value and issuing in exchange common stock of no par value on the basis of ten shares for one. This exchange will increase the proportion of outstanding common stock from 18.9 per cent to 29.8 per cent of the whole.

Power Company to Buy Municipal Plant.—John R. Coston, Mayor of McKenzie, Tenn., has sought authorization from the Railroad and Public Utilities Commission of the state to permit engineers to make a valuation of the McKenzie plant in anticipation of its sale to the Kentucky-Tennessee Light & Power Company. This company has recently secured several other municipal plants in west Tennessee.

Missouri Utility to Expand.—The Missouri Public Service Commission has approved of the sale of $434.500 7 per cent par value bonds and $45,500 par value common stock by the Missouri Public Service Company and the issuance and transfer of $45,500, par value, of its common stock to the Community Power & Light Company of St. Louis. The purpose of the financing is to provide funds for the purchase of electric plants at California, Bunceton, Tipton, Clarksburg, Speed, Bell Air, Eldon, Versailles and Cardwell, Mo., and to construct a transmission line from Eldon to Versailles.

Extra Dividend Declared.—An extra dividend of 10 cents per share has been declared by the Penn Central Light & Power Company on the preferred stock in addition to the usual quarterly dividend of $1 per share both payable October 1 to holders of record September 10.

Missouri Utility to Purchase New Property.—The West Missouri Power Company has been authorized by the Public Service Commission of Missouri to issue $220,500 par value 7 per cent cumulative preferred stock and $870,000 par value twenty-year first mortgage 6½ per cent bonds. The purpose of the financing is to raise funds for the purchase of the stock and bonds of the Fort Scott & Nevada Light, Heat, Water & Power Company, which will be consolidated with the West Missouri Company.

Utilities Seek Authorization to Merge.—Approval of the merger of the Middleport (N. Y.) Gas & Electric Company and the Newfane (N. Y.) Electric Company into the Lockport & Newfane Power & Water Supply Company of Middleport has been sought in a petition filed with the Public Service Commission of the State of New York. It is stated in the petition that both companies desire to sell all their franchises and systems to the new company. Authorization is also asked for a bond issue of $300,000 to meet the estimated cost of the development of the power site.

New York Utilities Combine.—The J. J. Rogers Company of Ausable Forks has purchased the property and holdings of the Northern Adirondack Power Company, Keeseville, N. Y., and will continue to operate under the name of the latter company. The Ausable Forks concern not only purchased the Northern Adirondack Power Company but also the Peru Steel & Ore Company, both companies selling at a large profit to the original stockholders. The new officers of the organization are: L. H. Chahcon, president; H. G. Rogers, vice-president, and F. L. Kemp, secretary.

Government Loses More than One Hundred Million Annually in Tax Exemptions.—The report made by the Federal Trade Commission to Congress on tax-exempt securities says there are in the United States about $32,000,000,000 of wholly or partly tax-exempt securities, $4,500,000,000 of which are owned by persons having incomes of more than $10,000 a year. Tax-exempt interest received by individuals whose taxable income exceeded $10,000 each is estimated at approximately $176,000,000 during 1922. The loss to the government on this in taxes, amounting to $58,000,000, plus the loss on tax-free corporation securities, amounting to $44,000,000, makes a total loss of about $102,500,000.

Commission Rulings

Duty of an Electric Utility to Supply Wholesale Customer on Whom Consumers Outside Utility's Territory Are Dependent.—The village of Stites complained to the Idaho Public Utilities Commission that the Kooskia Milling & Power Company's facilities were inadequate to meet the needs of the village for light and power. It appeared that the village is outside the company's territory, but that the company had undertaken to supply the owner of a transmission line with electrical energy to meet the needs of Stites. While finding this owner alone responsible for the distribution of the energy, the commission ordered the Kooskia company to enlarge its plant or otherwise arrange for a continuous supply of electricity to him.

Confusion Between Cost and Value.—Quoting a venerable dictum of the United States Supreme Court, "Never was it held that the cost of a thing is the test of its value," the Pennsylvania Public Service Commission recently, in valuing the Lehighton Water Supply Company, took occasion to allude to the constant cropping up of the old fallacy. Said the commission: "The value of any commodity or service is a product of many considerations, among which cost has a part. The value of a public utility property can be determined only after considering all elements affecting that value. The commission interprets its function to be the exercising of its best judgment upon the many facts which are brought to light. To decide solely on the basis of one of these facts is to exclude others which are, perhaps, more relevant. Original cost and present cost must both be considered and then 'given such weight as may be just and right in each case.'"

Change of Rate Does Not Necessitate Refund if Saving Over Old Schedule Is Shown.—The Illinois Commerce Commission has refused to require the Commonwealth Edison Company to refund to Railton & Company the difference in customer's favor between the consumer's bills under a new rate and those it had paid for the previous year. The commission found that the utility's practice with regard to publicity and changing rates for customers was fair and reasonable and that the conditions and circumstances controlling the customer's consumption were within the customer's knowledge and control. The commission said: "To adopt complainants' contention in this respect would result in shifting the responsibility of the selection of rates from the customer in whose control the conditions of service, such as consumption, maximum demand, load factor and hours of use, as well as changes or contemplated changes in such conditions, are, to the respondent, which has no control over such conditions. Then, too, the particular class of rates charged any customer is for a particular class of service and is based only in part upon the amount of electricity consumed, and if in any case, after the service is actually rendered, respondent be compelled to refigure the customer's bills for the previous year on a rate for service different from the rate for the service which was rendered, respondent will be subjected to a financial loss which in the final analysis would have to be borne by respondent's other customers."

Demand Charge as It Affects Small Power Consumers.—In granting increased rates to the municipal plant of the village of Cadott the Wisconsin Railroad Commission said that a demand schedule should be established for large power customers who create a large demand while having a small consumption of energy, but the demand schedule should be supplemented by a step schedule under which small power consumers with a relatively low demand may obtain service at something less than what might otherwise result in prohibitive rates.

Recent Court Decisions

Trespass and Negligence as Causes of Damage in Overflow of Reservoir.—Damages for trespass were awarded to the plaintiff Butala in an action against the Union Electric Company, which owns and operates a hydro-electric plant discharging into a reservoir known as the Sturgis ditch which conducts the discharged water to the Beaverhead River. Owing to an accumulation of ice the ditch overflowed and damaged plaintiff's land. The Supreme Court of Montana has reversed the verdict, holding that no trespass such as was alleged had been shown and that there should have been a directed verdict for the defendant. If any cause of action existed, the Supreme Court said, it was for negligence, which was not alleged, since the damage complained of was not the direct result of an act of the defendant but only consequential. (226 Pac. 899.)*

What Constitutes Public Service?—In Southern Ohio Power Company vs. Public Utilities Commission of Ohio the Ohio Supreme Court has found for the plaintiff, thus upsetting a schedule of rates fixed for the company by the commission on the petition of consumers. The court holds that the Southern Ohio Power Company is not a public utility, no presumption of a dedication of its property to the public service arising from its sale by private contract of its product and service to utility corporations for purposes of resale. It quotes from a former decision made by it in which it said: "The Southern Ohio Power Company, as such, has never qualified as a public utility and disposes of its entire output of electrical energy by private contract to the Athens Electric Company and the Hocking Power Company." (See ELECTRICAL WORLD for September 15, 1923, page 561.) In the former decision, however, the court held that the commission might regulate rates of a corporation not a public utility where these involved contract rates of a utility. The later decision modifies this judgment and was vigorously dissented from by one judge. (143 N. E. 700.)

Damages Denied for Death of Boy Who Climbed Tower on Defendant's Property and Came in Contact with Wires.—The Supreme Court of New York, Appellate Division, has reversed the verdict of a jury in Brown vs. American Manufacturing Company finding the company responsible for the death of a boy killed by contact with the company's electric wires carried on a tower erected in a tenement-house yard which the company owned. The Supreme Court held that though the boy was a licensee upon the premises, where he had gone to play, he was a trespasser as regarded the company's tower, upon which he had climbed to the top, and that there was no reason why the company should have anticipated that children would climb the tower or have had knowledge that such a practice existed, the tower not being near the company's plant. Negligence could not be imputed because the company had failed to exercise the highest vigilance. (205 N. Y. S. 331.)

Principles of Valuation.—Dismissing without prejudice a bill in equity brought by the Reno Power, Light & Water Company against the Public Service Commission of Nevada, which had disapproved a proposed increase in the company's gas rates, the United States District Court for Nevada laid down certain principles which it held should govern valuation proceedings. Among these were the following: Reproduction costs at prevailing prices are highly important but not necessarily controlling. Reasonable value of public utility property should be gathered from a careful and comprehensive consideration and comparison of its original cost, cost of reproduction new, depreciation, additions, improvements, present and probable future revenues and expenses, market value of stocks and bonds, and any factor or circumstance which adds to or takes from its value. Deficiency in past income is not part of reasonable reproduction value. That company is going concern rather than plant without customers or business is property. Where physical items of plant have been appraised at what it would cost to reproduce them new, and they are not new, accrued depreciation must be found and deducted for rate-making purposes. Cost of enlarging and improving plant is investment and should be fairly included in the reasonable value of utility, and every item thereof ought to be strictly excluded from operating expense account. (298 Fed. 790.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Manufacturing and Markets

A Proof of Waste in Packing

Need for Simplification in Shipping Goods—Facts Collected from Eight Jobbing Houses Show the Existence of a Standard Packing Problem

By George W. Johnston
President Mid-West Electric Company, Omaha, Neb.

THE widespread general interest in the idea of simplifying lines of manufactured products by eliminating obsolete, duplicate and excess varieties has made real progress. Styles of hotel china have been reduced from 700 to 243. Styles of rasps have been cut from 1,351 to 496. Range boilers are down from 130 to 13. There used to be sixty-six varieties of paving bricks and there are now six, while ordinary rough-face bricks have been reduced from thirty-six sizes to one kind. Again, 2,998 types, sizes and varieties of locks, bolts and other shelf hardware, exclusive of differences of finish, have been pared down to 1,205 and will be still further cut. In our own industry the General Electric Company eliminated almost a thousand numbers in its wiring-device line, and Klein tools were cut in one case from thirty-two patterns and eighty-four sizes of pliers, 5 in. to 10 in. in size, to thirteen patterns with a 70 per cent reduction in sizes. There are many other cases. These are just good examples.

Methods Need Simplifying Too

In short, the common sense of simplification has been established pretty well in the minds of the men of industry. But the principle involved still needs a wider understanding, for it can be applied no less to the introduction of economy into the shipping methods of the electrical industry, for instance, than in the reduction of the number of products manufactured. In a word, we have an opportunity to simplify our packing habits that will save money no less directly than by reducing the burden of stock. Especially does this seem to be the case with wiring devices, where the number of small orders is notorious.

So great has the burden become that today an opportunity for reform exists that challenges the attention of the entire jobbing industry as well as the manufacturers. The condition is the product of a habit—a bad habit—that can be corrected just as soon as the manufacturer and the jobber will take the trouble to make a determined effort to correct the lax, unthinking buying and selling habits of the men who handle these goods, right through the course of distribution. For the consumer is not entirely to blame that these goods are being purchased in uneconomical quantities. The distributor himself has not been offering the goods in proper quantity and with proper price differentials, thus actively encouraging good buying habits.

A Test on Packing

To determine the actual facts the wiring-device committee of the Electrical Supply Jobbers' Association not long ago made a little informal investigation of the number of orders of certain commodities that are being shipped in various quantities by eight jobbing houses situated in New York, Pittsburgh, Columbus, St. Louis, Omaha and Los Angeles. The accompanying tabulation shows the result. It is worth a little study, for it throws the light of day upon a condition common throughout the country which is adding a great deal of unnecessary expense to the cost of distribution.

Consider item No. 1 for example—standard key sockets. Out of 858 orders shipped by these eight jobbers, 27 per cent of the shipments were for lots of less than ten sockets—which meant 231 separate packages to handle and record all down the line. To correct this wasteful system of shipping many small orders where fewer larger orders would do as well, it is necessary first to rearrange standard-package quantities to suit more conveniently the present-day conditions and then make the price consideration for the purchase of unbroken lots sufficient to be worth while. Once this is done, the consumer can be educated to take advantage of the benefits offered by a little more forethought in specifying quantities when he orders, and the trade will soon see that it pays to guide the buyer to ask for quantities that are more economical to handle.

The hardest thing that will have

ANALYSIS OF PERCENTAGE OF ORDERS BY UNIT QUANTITIES

(Showing average orders by the number of jobbers reporting orders.) Figures are taken from eight obbers in New York, St. Louis, Omaha, Los Angeles, Pittsburgh and Columbus.

Wiring Devices

1—Key Socket
2—Pull Socket
3—S. P. Switch
4—Tumbler Switch
5—Flush Receptacle
6—Ind. Snap Switch
7—Cleat Rosette
8—Two-Piece Rosette

	Size of Lots										Total
Item	Under 10	10	12	20	25	50	100	200	250	500	Orders
1	27	4	5	1	26	13	14	3	1	6	858
2	32	8	4	1	24	16	6	2	6	1	864
3	21	25	3	8	4	11	21	3	1	3	818
4	22	26	3	12	4	7	21	1	1	3	629
5	30	32	2	9	3	8	10	2	1	3	772
6	30	30	3	12	5	10	5	1	2	2	761
7	21	32	2	14	4	14	9	1	2	1	597
8	9	33	2	20	9	15	9	..	3	..	523

Glass Insulators: 1, No. 19; 2, No. 9

	Size of Lots											Total
Item	Under 10	10	12	20	25	50	100	200	400	800	1,000	Orders
1	7	4	4	6	7	13	19	27	11	1	1	653
2	12	6	3	5	12	9	17	13	21	1	1	672

Porcelain: 1, "Nail-it" knobs; 2, ⅛-in. x 3-in. tubes; 3, two-wire cleats.

	Size of Lots									Total
Item	Under 100	100	200	300	500	1,000	1,500	2,000	Bbl.	Orders
1	24	17	8	5	24	9	1	4	8	8[illegible]
2	30	18	8	5	19	9	2		10	77[illegible]
3	42	18	10	2	14	4		2	8	65[illegible]

to be faced will be to obtain co-operation from the electrical manufacturers and jobbers themselves. Opinions among jobbers as to what changes in standards would most help the situation naturally differ widely. Manufacturers are willing to agree in general that something ought to be done, but they do not do anything specific.

COMMITTEE MAKES RECOMMENDATIONS

The first action with definite aim to relieve the situation was taken by the wiring-device committee of the Electrical Supply Jobbers' Association this summer. The committee recommended that key, keyless pull and all other sockets be packed in cartons of ten and that ten cartons constitute a unit package. The idea of the committee was not so much to change the standard-package quantity on shipments of 500, for if the manufacturers desired it, there would be no objection to making the standard-package quantity 500 or 1,000. The desire was for a unit package and a carton that can be packed and shipped without expense to the jobber. The committee also recommended that wiring-device schedules be revised to show three classes of material — fast-moving items, medium sellers and slow-moving items.

The manufacturers, on the other hand, seem to feel that the cost of packing would be increased by carrying out this recommendation for smaller-unit cartons and point out a practical difficulty in classifying lines as fast-moving or slow-moving, since conditions differ widely in different cities. The presence of a number of fixture manufacturers in a town will seriously affect the demand for sockets, for instance.

FURTHER INVESTIGATION NECESSARY

The solution probably lies in the direction of a broader investigation of present practice in more or less the same way that the study has been made by these eight jobbers on a limited number of commodities. It will require the co-operation of both the jobber and the manufacturer. Careful studies must be made in the different territories and data developed that will show conditions as they are and the "why" of them, and then men must be willing to meet the facts and adjust themselves to the need. It is an issue of sufficient importance to deserve immediate attention.

More Manufacturers Express Optimism

Further Letters from Prominent Electrical Manufacturing Executives Show Growing Confidence in the Business Outlook

EVIDENCE continues to gather that business in the electrical industry is pulling up out of the valley, and opinion seems to be steadily strengthening that the prospect for business this fall and in the coming year is bright. Because all men are naturally keenly interested to know what others think of the general outlook, the ELECTRICAL WORLD has been sounding out numerous executives whose contact with the market is close and whose product has a wide range. These letters, following those published on August 9, still further support the growing confidence that better business lies ahead.

On Eve of Great Activity—No Boom, but Healthy Business Expected

From W. C. BRYANT
President the Bryant Electric Company, Bridgeport, Conn.

I am an optimist. The fundamental conditions of this country are sound and indicate, I believe, good business for several years to come. By "good business" I do not mean boom business, but a good, steady, healthy amount of business for nearly every industry. For the next few months the wiring-device lines will benefit partly by seasonal requirements and partly by an increasing activity in general business. The wiring-device line, being largely dependent upon new buildings, will suffer somewhat in the future unless the cost of building is reduced, as I believe it will be in the next few years.

I think the electrical industry as a whole is on the eve of great activity. The superpower plan and the decreasing cost of producing energy all tend to increase the use of electricity and consequently the number of energy-consuming devices.

Heading Into Better Times—Steady Increase in Sales Looked For

From H. B. WILSON
General Manager Mathias Klein & Sons, Chicago

Generally speaking, we understand that jobbers' stocks are below normal, and we cannot but feel that it will be necessary for them to be replenished very shortly to enable the jobbers to give service to their customers (telegraph, telephone, light and power companies) that are planning construction work for this fall.

There is a general feeling of increasing confidence in the immediate future, so that if the expected upward swing does not materialize it will be entirely contrary to the belief of a majority of our friends and of ourselves. We are not looking for anything in the nature of a boom, but we do most sincerely believe that we are heading into times which will offer a steady increase. This in our opinion is better than any boom could be.

Splendid Inquiries and Orders—Preparing for Large Business

From WALTER A. BATES
Vice-President Bates Expanded Steel Truss Company, Chicago

Business to us is really looking a great deal better. Our low period was in July, during which we kept reasonably busy, but on work that was not so big in tonnage volume as our average for the past year. During the latter portion of July and so far this month business has taken a very pronounced turn for the better. We have received some splendid orders for both our expanded poles and fabricated towers and structures of all kinds, and our inquiries have been very much better and greater, which is always an indication of better business in the months that follow.

We are so certain of a better volume of business coming through now that we are putting in a large supply of raw materials of all kinds, sincere in the thought that the bottom of the depression has been reached. We are very optimistic over the outlook, our feeling being based not only upon our opinion but upon actual increase in volume of inquiries and orders and tentative propositions on which we have been asked to make estimates, some of these not to be constructed until the year 1925.

Increase Expected Before End of Year—Spring Outlook Good

From H. D. SHUTE
Vice-President Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

The managers of our fourteen sales districts in this country have recently indicated their views as follows: Ten think business will hold level, three think business will increase, and one thinks business will decrease during the coming six months, as compared with the six months just ended. The fact that our inquiries are increasing in volume in nearly all of our lines indicates to me that we shall see an increase of business to a fair amount before the end of the year.

The educational lighting campaign now being carried out vigorously is going to stimulate the use of electrical energy and will undoubtedly lead to further extension by the forward-looking public utilities. The industrial companies of this country are preparing for increasing business, and this means the purchase of electrical appliances and the use of electric power. In the radio field the demand during the

summer months has been unprecedented and bids fair during the fall and winter to exceed all previous figures.

Also the electric railways are, in general, in better condition, and the public is more and more coming to the general use of electrical devices in the home. Taking these things into consideration and having in mind the ease of money, it is my feeling that while we shall not have any very great increase in business for the next three or four months, we should look for a good volume during the late winter and next spring.

Year Ahead 23 per Cent—Expect Last Four Months Better

From R. E. EDWARDS
President Edwards & Company, Inc., New York City

Our business for seven months of this year shows an increase in volume of 23 per cent over the same period of last year. The increased number of shipments for this same volume, however, has been large, increasing the expense and naturally reducing the net profit.

Those particular articles which we look to as an indication of general conditions have maintained their proportionate increase, which seems to indicate a disposition to proceed conservatively, and there seems to be ample evidence that the stocks of jobbers are being maintained at as low a level as possible.

All things taken together and despite the fact that this is a Presidential year and that the political situation is complex, and notwithstanding the pessimistic attitude that prevails in some quarters, we anticipate a better condition for the last four months of the year than existed in the first four months and indications seem to point to good business for 1925.

Many Signs of Further Improvement—Business in a Healthy Condition

From A. D. CURTIS
President Curtis Lighting, Inc., Chicago

To me it seems that there is good cause for optimism as to the immediate future from the business outlook as we see it here in our activities. The mail brings us daily an increasing number of evidences that business as it concerns us is in a healthy condition, and there are many signs of continued improvement.

We expect to be very busy during the balance of the year, our factory being well filled at present with both large and small orders of various sorts, and from the reports coming in from our various men in the field a heavy demand is looked for straight through for the next several months.

It is not our idea that the increase in activity which has been noticed lately is seasonable, but rather we feel that it is an indication of the confidence every one has that the country will enjoy a very remarkable period of prosperity during the next several years.

Business Conditions

A Survey of Important Developments in the Electrical Market Including Data on Production, the Sales Outlook, Credits, Exports, the Metals and Other Conditions Affecting Cost, Supply and Demand

BUSINESS has been quiet during the last week with no marked developments. A gradual increase in sales and a steadily upward movement continue in most sections while conditions are spotty in others, but expressions are unanimous that the upward movement will continue and become more prominent in the fall. It is further believed that the operation of the Dawes plan will have a world-wide effect on business conditions.

Several manufacturers have reported very good buying of apparatus by steel companies, which are reputed to arrange purchases for the most advantageous buying period. Present purchasing is looked upon as an indication that the time is not far off when prices will stiffen and conditions will cease to be so favorable to the buyer.

In New England business conditions are strengthening, and this tendency is accompanied by a gradual increase in sales of appliances and supplies. Jobbers report a better outlook and a fair gain in orders in this district. Conditions are spotty in New York and a decrease in sales is noted by some manufacturers, but all agree that a continued upward volume of business will be transacted. In the Southeast jobbers' business is very good, and weather conditions are favorable to crops except in some sections where a shortage of rain is causing concern. Business is moving steadily upward in the Middle West. Prices on flexible armored cable have been reduced about $1 per 1,000 ft., and radio apparatus is starting to show improved activity. On the Pacific Coast much construction work that is being undertaken by various utility companies will cause active conditions for some time. Motor business is fair and stocks are adequate in this section.

Porcelain Insulator Deliveries Good—Demand Decreased

IN DIRECT contrast with deliveries available in 1923, the manufacturers of porcelain insulators are now able, on standard lines, to quote deliveries ranging from four to six weeks. This has come about because of improved factory production by several of the larger manufacturers. The new kiln installed by one company has increased its production by 40 per cent. Another factor helping the delivery situation is a decreased demand for insulators due to the policy adopted by central stations and railways to curtail their expenditures especially with regard to line extensions. On the whole, sales have been running between 75 per cent and 85 per cent of those obtained during the summer of 1923.

Prices have not changed for some time and there are no indications that they will do so, although with the receding market there is evidence of looser prices and greater concessions. Raw materials, including raw porcelain and steel, are readily available, and the sentiment among labor appears to be that work is now welcomed—which was not so true last year. Porcelain companies think that the fall business will improve gradually, though not with any abrupt change in demand, since most of this year's budgeting for the construction of transmission lines has been completed. The present low demand, however, must reflect itself sooner or later in a large future demand, with resultant heavy burden on the manufacturers, extended deliveries and probable stiffening of prices. Plants are now running full time to provide production for business obtained this summer and in order to have good stocks this fall to help utilities complete many of their transmission lines before winter sets in.

Demand for Control Apparatus Improving—Prices Stationary

THE demand for control apparatus has improved somewhat this month after having shown a falling off in June and July in line with the tendency to purchase for immediate requirements only. Some manufacturers note a rapidly growing demand for automatic apparatus as distinguished from manually operated starters and controllers. Automatic types have in certain industries supplanted the manually operated types. Automatic water systems, automatic air compressors, automatic pumps of various kinds, such as condensation, vacuum pumps, cellar drain pumps and sump pumps, together with automatic household refrigerator units, temperature controls, etc., also present a good field for automatic control. There is besides a strong trend toward the fully inclosed type of starting apparatus, and in some sections of the country this is now required by local regulations.

Deliveries in general have been good and run from three weeks to four weeks except for large apparatus, which runs from six weeks to eight weeks as a good deal of industrial control material is special and cannot be carried in stock. Prices are stationary and no changes are contemplated. Some manufacturers feel that prices are too low considering the advance which has been made in the cost of labor and in the cost of some of the raw material used.

Cross-Arm Purchasing Improves —Price Increase Probable

IT IS common knowledge among the fir cross-arm producers that prices will probably increase during the fall. According to the general manager of a large cross-arm company, who made an investigation as to further price reduction possibilities, the pres-

ent business level affords very little or no profit, and an increase can be expected when the fall demand again starts. Business for the past six weeks has felt the usual summer slump, but production has been kept up and present buying by the larger utility companies has started. These companies are said to be desirous of taking advantage of the current low prices.

Improvement in Demand Noted in Lighting Equipment

THE past demand for commercial and industrial lighting equipment has been limited because of cautious buying. There has been little disposition to purchase except for immediate use, with the result that many small orders are the rule. However, since the first of July an improvement in demand has been noted, but conditions are spotty. As far as residential lighting equipment is concerned, the trend, though slow, now seems to be toward decorative effect in glassware with shades both for the standard electric holders and for use with candle and ball lamps as well as with inclosing globes. There appears to be a tremendous field that is still untouched, and the greater interest that is being developed in lighting equipment will compel many inadequate lighting systems to be replaced. Within the past two years many new factors have entered the glass industry and have resulted in a decrease of business of each of the older companies and price changes at various times, due to competitive conditions, for there has been no change in labor costs and very slight change in material costs.

It is generally believed by the lighting-equipment industry that the demand will be substantially increased this fall. Standard items usually carried by jobbers are expected to be particularly active as jobbers have little stocks. In addition, improved methods of packing in individual cartons, free from the dirt of the obsolete form of hay packing, has a great tendency to encourage jobbers in the handling of reasonably large quantities of lighting glassware. Deliveries on standard equipment are very prompt as manufacturers have reasonably large stocks. The special nature of many orders is, however, the limiting feature of delivery. There has been no recent change in prices and none is expected, but, as in other lines during a period of inactivity, there has been a recession in prices.

Less Activity in Non-Ferrous Metal Market—Copper Declines

THERE has been less activity evident in the non-ferrous metal market. The demand for copper has fallen off as the combined result of a reduction in London prices and the free offering of speculative holdings at weakening prices. As prospective buyers have been able to force concessions they are reluctant to make purchases. Large sellers have receded slightly from their 13¾-cent level and from other sources a moderate tonnage was available at the bottom price of 13¼ cents.

The demand for lead has fallen off materially, the lower trend of the foreign market having influenced buyers, but the American Smelting & Refining Company is maintaining its 8-cent level. Other sellers are also holding their prices but find it hard to do business at that level.

NEW YORK METAL MARKET PRICES

	Aug. 13, 1924 Cents per Pound	Aug. 27, 1924 Cents per Pound
Copper, electrolytic	13⅜	13¼–13⅜
Lead, Am. S. & R. price	7½	8
Antimony	8⅝	10½
Nickel, ingot	27	27
Zinc, spot	6.175	6⅝
Tin, Straits	52	51⅛
Aluminum, 98 to 99 per cent	28	28

Zinc is not in great demand and prices have weakened owing to selling pressure by small producers who are anxious to dispose of their output. The lower quotations have discouraged a number of buyers who had been making inquiries. There is little activity in the tin market. Prices of tin have declined here and abroad due to lack of professional support.

Middle West Trade Moving Steadily Upward

BUSINESS is improving steadily in the Middle West, and by September it is believed that sales will exceed the same period in 1923. Orders for code wire are small but frequent, some manufacturers having increased prices last week and others being expected to follow shortly. Stocks of code wire in warehouses are very complete. The base price on magnet wire advanced from 16½ cents per pound to 16¾ cents. Prices on No. 14 two-wire, single-strip, also double-strip, flexible armored conductor were reduced about $1 per 1,000 ft. Manufacturers of busbar copper are expecting an advance in price soon, and they also look for increased business in the fall.

Radio apparatus sales are starting to show improved activity. Dealers are placing good-sized orders in anticipation of the demand that will come with cooler weather. The fan business is considered practically over, with dealers in some cases still carrying large stocks. The warm weather of last week has had a tendency to cut down sales of electric heating appliances and increase fan business slightly.

Business Good in Southeast—Two Large Contracts Placed

BUSINESS in the Southeast is reported by jobbers as very good. Two large construction contracts were awarded in Atlanta last week, one covering additions and improvements to the Atlanta shops of the Southern Railway and the other a 214-room addition to one of the new hotels, in connection with an eight-story office building and theater. This latter contract is valued at $1,500,000. A few weeks ago ranges showed a tendency to slow up, but this has proved to be only temporary as jobbers and manufacturers representatives state that a steady, healthy range business is now the rule.

Favorable weather conditions generally continue, with a corresponding beneficial effect on crops and the market, though there are spots where shortage in rain is causing some concern. The Georgia peach crop was probably the most successful in years, and while the price obtained was not up to expectations, large sums of money have been put into circulation. Conditions in the peach-growing sections are the best for several years and retail sales show a marked increase. Prospects are that the tobacco and peanut crops, which are both excellent this year, will add further to the prosperity that will result from the marketing of the cotton crop in September.

Increase in Fall Trade Expected in New England District

STRENGTHENING business conditions accompanied by a gradual increase in sales of appliances and supplies mark the New England district. Jobbing houses which adhere to price stabilization report a better outlook and a fair gain in orders, with some improvement in credits. Cut-price trade is in evidence in certain districts, but this is not injuring the old-line houses to any great extent, as it is largely confined to buyers with poor credit ratings. One jobber specializing in sales to contractor-dealers expects a building boom in September, with resultant added buying of wiring supplies. Central-station outputs continue to surpass last year's figures and expansion of plants will be carried far into the fall.

An immediate advance in high-grade radio sales is expected by jobbers, and in the appliance field flatirons are selling in heavy volume, with fair movement in washers and cleaners. Farm-lighting sets are running well ahead of last year, and household refrigerating outfits are making striking gains. Prices are steady in general, but rubber-covered wire has stiffened.

Business Spotty in New York District—Radio Sales Good

THE improvement in business noted in the New York district the first part of this month has not generally kept up. Conditions are spotty, some manufacturers reporting about the same sales while others say that there has been a decrease. All manufacturers, however, agree that the fall will see a continued upward volume of business being transacted.

Among the jobbers, business is quiet with one or two exceptions where sales are reported as being good owing to active central-station construction in certain localities. Many people are said to be discussing fall purchases, but not much immediate business is being transacted. The summer trade as a whole is said to be better than last year's with the exception of fan sales. Radio business has kept up very well this summer, the volume being about three times that of last summer, and it is reported that many more high-priced radio sets are being sold. Among the manufacturers of apparatus used in radio sets many substantial orders have been received, indicating that the radio industry is preparing for a large fall season. Some jobbers are conduct-

ing fall campaigns for heaters, and practically all are preparing to meet the demand that will develop for appliances required during the holiday season.

Central-Station Construction Continues on Pacific Coast

A SUMMING up of central-station construction work being performed by various utility companies on the Pacific Coast gives assurance that the present activity will continue for some time. The Commissioner of Light and Water of Tacoma, Wash., is taking bids until September 10 and September 24 for equipment to be used at the Lake Cushman municipal power project, including disconnecting switches, switchboards, electric traveling crane, etc. Motor business is fair with entirely adequate stocks. New ordinances enacted in Oakland, Cal., effective October 1, require conduits in all buildings except one-story or two-story dwellings and frame buildings, also the use of galvanized or sherardized conduit for all exterior work and an appliance outlet in each of the main rooms of a house.

Jobbers report that building in Seattle and the other Sound cities is holding up well and that a sales volume comparable to the former week is being transacted. Somewhat larger and better assorted orders are being received. Dealers are making cautious inquiries as to the near-future market of conduit and rubber-covered wire owing to recent price stiffening of these products and to the habit of hand-to-mouth buying which has been practiced for the last year. The radiator season has opened with abnormally keen competition, which has already resulted in a one-dollar list price decrease in the standard type of heater. Christmas-tree outfits are now being solicited by a number of Eastern manufacturers, but the local trade intends to buy cautiously because of last year's unsatisfactory market and the usual December dumping.

Activities of the Trade

Devoted to News of the
Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

Electric Boiler Appoints Northeastern Distributor

The Electric Boiler Corporation, Cambridge, Mass., has made an agreement with the Pettingell-Andrews Company, Boston, whereby the latter will distribute the corporation's products throughout New England. A. F. Graham, sales manager of the former company, states that this summer's business exceeds that of last year by 25 per cent. Recent sales include a 1,000-gal. water-heating tank to the Edison Electric Illuminating Company of Boston for substation service.

Hoover Company Holds First European Convention

The Hoover Company, North Canton, Ohio, manufacturer of vacuum cleaners, held its first European Hoover convention this month at Bushey Heath, a suburb of London. H. W. Hoover, president of the company; H. Earl Hoover, vice-president; Fowler Manning, director of sales; E. C. Marine, head of the educational department, and R. C. Elliott, in charge of sales personnel, went to London to attend the convention.

The convention was conducted along the lines of the fourth international Hoover convention held at North Canton, Ohio, last July. It consisted of two sections. The first week was for the salesmen, to whom a standardized, thorough and efficient method of demonstrating the suction sweeper was presented. The second week was for managers and supervisors, who were instructed in improved methods for hiring, training and supervising the increased number of salesmen that will be needed to care for the greatly enlarged demand that has developed for the suction sweeper during the past year. Suction sweepers are sold in Europe on the same plan as in the United States and Canada.

Allis-Chalmers Purchases Adjoining Property

The Allis-Chalmers Manufacturing Company has purchased 23 acres of land immediately adjoining the company's West Allis plant to the east. No plans have been made for the development of the property, which was bought because the land was available and since it adjoins the company's property offers very good space for possible future expansion.

At present the company is just completing a new pattern storage building, 119 ft. x 137 ft., seven stories high. This building is estimated to cost between $150,000 and $200,000.

International Combustion Gets Orders from Germany

The International Combustion Engineering Corporation, New York, has received advices from Germany confirming the receipt of orders for pulverized-fuel equipment amounting to $500,000. An additional $250,000 worth of business will also be closed very soon. A substantial increase in the volume of European business is expected by International Combustion, there being now more than $700,000 of active business in sight.

The Western Electric Company has leased a five-story and basement building to be erected on Columbus Avenue, near the Back Bay station, for a period of twenty-five years. The building will be occupied as a factory branch and distributing works, and the present plant at 385 Summer Street will be removed to the new location.

The Peabody Electric Company, Muskogee, Okla., jobber, held a sales meeting August 9 at the Hotel Severs at which there were present B. H. Sullivan of the Westinghouse Lamp Company, Frank Clemens of the Edward N. Riddle Company and A. H. Ellerman of the Moloney Electric Company, all of whom spoke on "Sales and Better Merchandising." A talk on "Better Co-operation with the Electrical Dealer and Contractor" was given by A. D. Peabody, president of the Peabody Electric Company.

Brown, Boveri & Company, Baden, Switzerland, manufacturers of electrical apparatus, are making synthetic cast iron out of their shop scrap, melting it in an electric furnace and treating it according to the use to which it is to be put. With 1.8 per cent silicon and 3.1 per cent carbon, the ratio of tensile strength is 35 as compared to 20 for cast iron made from common pig.

The Independent Electrical Supply Company, jobber, has completed moving into its new quarters at 52 Murray Street, New York, where it now occupies 25,000 sq.ft. of floor space. The company further announces that it has recently been appointed distributor for the "Murdock" neutrodyne radio sets and, in addition, will for the first time enter the field on an extensive scale in the jobbing of radio products of the better grades.

W. R. Ostrander & Company, 371 Broadway, New York, jobbers and manufacturers of bells, burglar alarms, etc., have since August 1 been distributors for the Bryan-Marsh lamp division of the National Lamp Works, Cleveland. To acquaint the salesmen of the company with the sales and advertising policies of the National Lamp Works, a meeting was held in the jobbers' quarters on July 31, with fifty-two executives and salesmen attending.

The Sibley-Pitman Company, Sixth Avenue and Thirteenth Street, New York, jobber, announces that the Brooklyn Supply Company, Brooklyn, acquired about eighteen months ago and since operated as a branch, will move from 56 Myrtle Avenue to Clinton and State Streets, in order to obtain better transit facilities and more space.

The B & R Electrical Supply Company, Denver, jobber, has been appointed distributor in the mountain region for the Line Material Company, Milwaukee, Wis., manufacturer of pole-line hardware, etc., and the "Hold-Heet" line of appliances made by the Russell Manufacturing Company, Chicago.

The Pacific Coast Steel Company, San Francisco, has been awarded the contract for furnishing steel transmission towers for 25 miles of line from the new Seal Beach steam plant of the Los Angeles Gas & Electric Corporation to the city of Los Angeles. The towers will carry two transmission circuits. Dwight P. Robinson is the engineer.

The Apex Electrical Distributing Company, Cleveland, manufacturer of vacuum cleaners, etc., has established a warehouse in Denver under the direction of H. P. Whitten, who was recently appointed division manager in charge of the mountain section.

The Gerard Electric Company, which lately moved from 69 Beach Street to 92 Pearl Street, Boston, has been appointed service and parts agents for New England for the Kellogg Manufacturing Company, Rochester, N. Y., air-compressor manufacturers.

The Charles E. Hayes Company, Springfield, Mass., wholesale distributors of electrical supplies, is erecting a three-story and basement building, 50 ft. x 98 ft., on Taylor Street, which will be used entirely for carrying stocks of electrical specialties. This corrects an item appearing in the August 9 issue.

The Acme Electrical Welder Company, Los Angeles, Cal., manufacturer of spot-welding machines, has appointed the T. L. Knudston Engineering Company, 184 West Washington Street, Chicago, as its representative in the Central States.

The Western Electric Company has appointed J. H. Kelly, formerly sales manager of the Tacoma (Wash.) branch for five years, as sales manager of the Seattle branch, to succeed Frank N. Cooley, who has been transferred to the Duluth (Minn.) office of the company, where he will become manager. The vacancy in the Tacoma office will be filled by V. E. McCain, supply specialist of the company in Seattle.

The California Wire Company, 204 North Cypress Avenue, Orange, Cal., manufacturer of insulated wire and cables, has tentative plans under advisement for the erection of a new plant in the vicinity of Pittsburg, Contra Costa County, Cal., to consist of a number of units, estimated to cost close to $1,000,000, with machinery. It is proposed to proceed with the initial structures at an early date. The company has a local plant at Orange and is operating with a capital of $3,000,000.

The New York Storage Battery Company, 162 West Fifty-sixth Street, New York, has leased the entire building at 694 Eleventh Avenue for new works and is arranging for early occupancy.

The Eastern States Battery Company, Buffalo, heretofore operating at 882 Michigan Avenue, has removed its plant to a building at 829-31 Michigan Avenue, recently remodeled for company occupancy, where considerable additional floor space will be available for necessary increase in operations.

The Pruiett-Conklin Electrical Manufacturing Company, with offices at 417 Calumet Building, Miami, Fla., has been organized and incorporated by Moman Pruiett and associates with a capital of $250,000. The company will manufacture "instant" electric hot-water heaters and appliances.

The Bakelite Corporation's Painesville (Ohio) plant suffered a fire loss on August 22 of approximately $60,000. The destroyed portion of the plant will be rebuilt immediately and it is expected that operations will be resumed within fifteen days.

New Equipment Available

Short Descriptions of New Apparatus and Accessory Equipment of Interest to the Electrical Industry and Available from Manufacturers and Announcements of New Lines

Electric Truck

A charging truck for malleable-iron-pot handling which receives 220 volts direct current from a trolley cable and delivers 24 volts to the truck motors has been developed by the Baker R & L Company, Cleveland, Ohio. In place of the usual storage battery, there is a flat compound-wound direct-coupled "Hertner" motor-generator set mounted on the truck. To keep the trolley cable taut, a "Haywood" spring take-up reel is provided. The truck will pick up and carry a stack of pots weighing 6,000 lb.

Double-Acting Diesel Engine

A new design of two-cycle, double-acting Diesel engine which is said to have a horsepower rating per cylinder higher than any yet attained in Diesel engines has been developed by the Worthington Pump & Machinery Corporation, New York. The new Worthington engine, characterized by simplicity of design and construction, was wholly designed and built in America and owes nothing to European patents or ideas developed abroad.

The cylinder of the new engine might be described as composed of two single-acting cylinders, opposed end for end and working in opposite directions, their respective pistons flanged to the same rod, the scavenging and exhaust ports, cooling-water circulation and expansion provisions of the two being virtually independent of each other. The engine is started and stopped by a single lever, which as it is moved forward successively opens the air-starting valves, then the fuel-supply valves, simultaneously closing the air-starting valves, the lever being then capable of setting, by a ratchet and pawl, at any desired fuel supply. To stop, all that is necessary is to throw this lever back to the stop position.

Spot Welder

A new spot-welding machine intended for continuous service in production work and known as the "type N" has been developed in three sizes, for handling different thicknesses of material, by the Taylor Welder Company, Warren, Ohio. The upper and lower horns of the machine are adjustable and permit the use of what are known as gooseneck welding points as well as welding in corners and inaccessible places.

The machines are equipped with 10-kw., 15-kw. and 20-kw. transformers respectively. An eight-step, self-contained regulator is provided for adjusting the current. The operating switch is designed so that it cannot close until the electrodes have made contact properly with the work, and adjustment is not required for different thicknesses of the work or because of wear of the electrodes. The switch is also provided with a lever for changing the trip quickly from automatic to non-automatic. Pressure on the welding electrodes is controlled by a hand wheel.

Phonograph Motor. — A direct-drive phonograph motor that runs at turntable speed without gears, belt or friction disk reduction and of the "Universal" type has been developed by the Hutches Engineering Association, Inc., 80 Maiden Lane, New York. The turntable spindle is integral with the armature or rotor. It will run at 40 r.p.m. minimum and 150-r.p.m. maximum speed, if desired. The motor is practically noiseless and is made "foolproof" by completely incasing it in a metal case and sealing it. The speed is regulated by a lever external to the case.

Paper Pulley.—A new line of paper pulleys, with a patented double-locking hub, which has three sets of two ribs each which grip into the paper and prevent the hub from coming loose, even though the pulley may be reversed in direction, is being marketed by the Best Pulley Manufacturing Company, 400 Talcott Avenue, St. Louis. These ribs are a part of the hub and extend out from it in a V-shape so that when the hub is hydraulically pressed into the pulley it becomes an intergral part of the pulley itself. The pulleys are manufactured in 2,500 stock sizes.

Electric Bell. — A transformer bell which has no contacts to cause sparking and requires only 1 watt to operate has been developed by W. R. Ostrander & Company, 371 Broadway, New York, for use in schools, mines, explosive vapor rooms, etc. The "one-watt efficiency bell," as it is called, consists of a special laminated core and insulated coils mounted directly on a terminal block of bakelite. The armature is made to have a natural period of vibration at a frequency of 60 cycles and is adjustable. A cast-brass gong top is used and is finished in statuary bronze. The standard rating is 12 volts.

Reflector-Shade Holder.—Three types of reflector-shade holder combination units which avoid the necessity of a separate shade holder with all usual pendant fixtures have been developed by the National Screw & Manufacturing Company, 2440 East Seventy-fifth Street, Cleveland. Types P and B are permanently attached to the standard heel-type "ABolite" reflector and are for use with medium-base porcelain and brass sockets respectively. Type A is an aluminum-threaded shade holder which is permanently attached to a special neck "ABolite" reflector and is for use with arrow-grip medium-base aluminum sockets.

New Trade Literature

LIGHTNING-ARRESTER GROUNDS.—The General Electric Company, Schenectady, N. Y., is distributing bulletin Y-1,949, entitled "Lightning Arrester Grounds," which gives information on the characteristics of pipe grounds, factors affecting their resistance, etc., and also offers general recommendations for ground connections to be used with lightning arresters on various classes of electric circuits.

ELEVATORS, CONVEYORS, COAL AND ASH-HANDLING EQUIPMENT.—Bulletin No. 98 issued by the Gifford-Wood Company, Hudson, N. Y., describes and illustrates the "G-W" elevators, conveyors, coal and ash-handling equipment.

PLANT EQUIPMENT.—The Walter A. Zelnicker Supply Company, 511 Locust Street, St. Louis, is distributing bulletin No. 326, covering its plant equipment specials.

SWITCHES AND RECEPTACLES. — Bulletins Nos. 17-29 and 17-30, distributed by Harvey Hubbell, Inc., Bridgeport, Conn., cover the "Hubbell" shallow flush toggle switches, schedule F, and the polarized flush receptacles, schedule H.

HOISTS.—The Silent Hoist Company, 302 McDougall Street, Brooklyn, N. Y., has issued bulletin No. 23-A, describing the use of its models "TK" and "TL" all-steel derricks to be mounted on trucks.

BRUSHES.—A series of charts indicating characteristics of brushes, such as specific resistance, current density, coefficient of friction, contact drop, hardness, breaking point, peripheral speed and recommended pressure, has been issued by Becker Brothers, 23 North Jefferson Street, Chicago, in a bulletin entitled "Physical Characteristics and Standard Qualities of Carbon, Graphite and Metal Brushes."

REFLECTOR-SHADE HOLDERS—The National Screw & Manufacturing Company, 2440 East Seventy-fifth Street, Cleveland, has issued two leaflets, calling attention to "ABolite glass-steel" combinations, parts and reflector-shade holders.

INSULATORS. — A pamphlet entitled "Thomas Link-type Hewletts" has been issued by the R. Thomas & Sons Company, East Liverpool, Ohio, covering its link-type insulators and fittings.

LINE EQUIPMENT.—The Line Equipment Sales Company, 18,222 Oakview Road, Cleveland, has issued a supplementary catalog and data book, known as catalog No. 1, of materials and supplies for line construction and maintenance work manufactured and carried by the company.

PRECISION INSTRUMENTS. — The Roller-Smith Company, 233 Broadway, New York City, is distributing bulletins Nos. 100, 200, 430, 550 and 560, covering its electrical instruments for signal system testing; portable, direct-reading rail-bond testers, types "SBT" and "HBT"; direct-current switchboard instruments; direct-current and alternating-current relays, and "Safety" inclosed circuit breakers, types "P" and "E."

Foreign Trade Opportunities

TENDERS ASKED FOR TRANSFORMERS FOR TARANAKI (NEW ZEALAND) POWER PLANT.—Tenders will be received until Oct. 7 by the Electric Power Board of Taranaki, New Zealand, for transformers (Contract No. 43).

PROPOSED HYDRO-ELECTRIC PLANT FOR WAIRERE, NEW ZEALAND. — Tenders will be received by the Electric Power Board of Wairere, New Zealand, until Oct. 7 for construction of a small hydro-electric power plant.

PROPOSED TELEPHONE LINE IN MEXICO.—Plans are being considered, according to *Commerce Reports*, for the installation of a telephone system to connect a number of towns in the State of Coahuila, Mexico. It is proposed to erect about 555 km. of line and to take in possibly six towns. Further details are being secured by the Electrical Equipment Division of the Department of Foreign and Domestic Commerce, Washington, D. C.

PROPOSED ELECTRIFICATION OF MADRAS RAILWAYS, INDIA. — The agent of the South India Railway, Consul-General A. W. Waddell, Calcutta, India, reports, has submitted proposals and estimates to the Home Board for India to electrify certain railways connecting Madras City with nearby towns. The electric traffic service, it has been considered, should first be extended to Thambaram, a distance of 18 miles. After the completion of the first section, it is proposed to extend the service from Thambaram to Chingleput, 37 miles off Madras Beach. As a preliminary to the electrification of the lines the work of doubling the line from Madras Beach to Thambaram and then to Chingleput must be started at an early date.

EXTENSION PROPOSED TO THE CALCUTTA (INDIA) ELECTRIC SYSTEM.—Preparations are being made by the Calcutta (India) Electric Supply Corporation, according to *Commerce Reports*, to increase the output of its plant by 20 per cent.

New Incorporations

THE BARNER ELECTRIC COMPANY, Kountze, Tex., has been incorporated with a capital stock of $10,000 by L. D. Barner, J. B. Hooks, Jr., and L. B. Pitre.

THE SCHULER ELECTRIC & HEATING COMPANY, Woonsocket, S. D., has been incorporated by E. M. Schuler, George M. Kennedy and S. L. Cooper. The company is capitalized at $300,000 and proposes to supply electricity, power and heat in Woonsocket and nearby towns, including Alpena, Artesian, Cuthbert, Fedora, Forestburg and Ruskin Park.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

BOSTON, MASS.—The Boston Elevated Railway Company has filed plans for the construction of a substation at 696 East First Street, to cost about $22,000.

BOSTON, MASS. — The Gillette Safety Razor Company, it is reported, has awarded contract for the erection of a superstructure for the power plant on West First Street, South Boston. Charles T. Main, Boston, is architect and engineer.

BROCKTON, MASS.—The Edison Electric Illuminating Company of Brockton, has petitioned the waterways and public lands division of the Department of Public Works for permission to erect two transmission lines across the Taunton River south of the Harris Street bridge in Taunton. The proposed line would connect with the power plant of the Montaup Electric Company, now under construction at Somerset.

WATERBURY, CONN.—The Connecticut Company is having plans prepared for the construction of a power plant, 72 ft. x 240 ft., on West Main Street. H. R. Stamm is architect and C. R. Harte, engineer, both at 129 Church Street, New Haven.

WOLCOTT, CONN. — The Waterbury-Milldale Tramway Company, Waterbury, has been granted a franchise to furnish electricity for lighting and power in Wolcott.

Middle Atlantic States

BROOKLYN, N. Y.—Bids will be received by Brigadier General Edward J. Westcott, the adjutant general, National Guard Headquarters, Room 829, Municipal Building, New York City, until Sept. 3 for construction, heating, sanitary, electric work, elevators and sprinklers, for the New York State Arsenal, Brooklyn.

BUFFALO, N. Y.—The Buffalo General Electric Company has taken out a permit to erect an operating and office building at 41-49 East Genesee Street, to cost about $75,000.

CLINTON, N. Y.—The Utica (N. Y.) Gas & Electric Company has applied to the Public Service Commission for permission to take over the municipal electric plant, the transfer of which has been approved by the voters. Extensions and improvements are contemplated by the company if authorized to take over the system.

HOPEWELL, N. Y.—Bids will be received by the Board of Supervisors of Ontario County ,Canandaigua, until Sept. 1 for furnishing three electrically operated pumping units for the County Almshouse, Hopewell. J. A. Beahan, Canandaigua, is superintendent.

LAKE GEORGE, N. Y. — The Lake George & Bolton Road Light & Power Company has petitioned the Public Service Commission for permission to sell its system to the Adirondack Power & Light Corporation. The company serves a portion of the town of Caldwell.

MINEOLA, N. Y.—The Board of Supervisors will build a power house at the proposed local court house and jail. The cost of the three buildings is estimated at $845,000. A general contract for buildings has been let to John D. Cosgrove, Mineola. William J. Beardsley is architect.

POUGHKEEPSIE, N. Y. — The Central Hudson Gas & Electric Company has applied for permission to construct electric distribution systems in the towns of Clinton and Unionvale and for approval of franchises granted by town boards.

WATERVLIET, N. Y.—The Foreman & Clark Manufacturing Company, 85 Fifth Avenue, New York, is reported to be planning for the erection of a power house at its proposed local factory for the manufacture of clothing, to cost about $200,000.

ALLENHURST, N. J.—The Eastern New Jersey Power Company plans to extend its light and power lines for service in the vicinity of Jamesburg, Hightstown and Allentown.

BRANCHVILLE, N. J.—The Council has contracted with the New Jersey Power & Light Company for local service, including street lighting.

NEWARK, N. J.—E. I. du Pont de Nemours & Company, 256 Vanderpool Street, have taken out a permit to build a power house at their local plant, to cost about $23,000.

PHILADELPHIA, PA.—Plans have been completed for the construction of a new power house at the Germantown Dispensary and Hospital, Germantown. Arthur H. Brockie, 254 South Fifteenth Street, is architect.

PITTSBURGH, PA. — Plans are under consideration by the Duquesne Light Company for the construction of a large distributing station between New Brighton and Rochester at a point overlooking Junction Park.

ANNAPOLIS, MD.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Sept. 2, for 2,950 ft. electric cable for the Annapolis navy yard (Schedule 2588).

MARTINSBURG, W. VA.—Preliminary plans are under consideration by the City Council for the construction of a municipal electric light and power plant.

PARKERSBURG, W. VA. — The City Council has approved the proposal to extend the ornamental lighting system to include a number of downtown streets. The lamps will be installed by the Monogahela West Penn Public Service Company.

ABINGDON, VA.—A proposal to issue bonds for the installation of a municipal lighting system has been rejected by the voters.

WASHINGTON, D. C.—Bids will be received by the chief of engineers, United States Army, until Sept. 10, for watertight lighting fixtures (Circular 3).

WASHINGTON, D. C.—Bids will be received by the Board of District Commissioners until Sept. 2 for ten electric transformers and transmission pole-line equipment.

WASHINGTON, D. C.—Bids will be received by the general purchasing officer, Panama Canal, until Sept. 12 for wire and cable, electric fans, ceiling fixtures, flashlights, etc. (Circular 1628).

WASHINGTON, D. C.—Bids will be received by the chief signal officer, United States Army, until Sept. 3, for 100,000 ft. pothead wire (Circular CP 18662-2); also, until Sept. 2, for 100,000 ft. cross-connecting weatherproof wire (Circular CP 18662-4).

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, until Sept. 2 for a quantity of globes for light fixtures for Eastern and Western yards (Schedule 2577).

North Central States

DETROIT, MICH.—The Detroit Edison Company has completed plans for the construction of two substations, one to be located on Forest Avenue and the other on Willis Street.

MARCELLUS, MICH. — The Michigan Gas & Electric Company, Ishpeming, is

planning to build a 25,000-volt transmission line to Marcellus for local service.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until Sept. 5, for "ornamental white way and park way" lighting standards for the division of light and power. Separate bids will also be received at the same time for lead-covered cable for the division of light and power.

CLEVELAND, OHIO.—Steps have been taken by business men on Broadway to secure the installation of an ornamental lighting system on that thoroughfare from Thirty-seventh Street to Miles Avenue.

MIDDLETOWN, OHIO.—The P. Lorillard Company, 119 West Fortieth Street, New York, plans to build a power house in connection with the erection of a number of buildings, supplementing the present plant on Central Avenue. The cost is estimated at $500,000.

TOLEDO, OHIO.—The Toledo Furnace Company plans to build a power plant in connection with extensions and improvements in its works, the equipment to include a 10,000-kw. steam turbo-generator, two 1,500-kw. motor-generator sets and auxiliary apparatus. Surplus power will be sold to the Toledo Edison Company. A susbtation will be built for converting current from 6,600 to 69,000 volts, at which it will be delivered to the utility company. Froelich & Emery, Toledo, are engineers.

EAST ST. LOUIS, ILL.—The Baltimore & Ohio Railroad Company plans to build a power house at its proposed local railroad terminal and yards. The entire cost is estimated at $5,000,000.

SPRINGFIELD, ILL.—Plans are under consideration for extensions to the municipal electric light and water plant, including the installation of a 10,000,000-gal. filtration and softening plant. The Burns & McDonnell Engineering Company, Interstate Building, Kansas City, Mo., is engineer.

MILWAUKEE, WIS. — Bids are being taken by R. Messmer & Brother, architects, 221 Grand Avenue, for a power house with 125-ft. chimney on State Street, for the Concordia College, to cost about $50,000.

EAST GRAND FORKS, MINN. — The Minnesota Sugar Company, 416 Oak Grove Street, Minneapolis, plans to build a power house at its proposed local sugar mill, to cost about $250,000, for which preliminary drawings are being prepared.

GLENCOE, MINN. — The Council will hold in abeyance the installation of the proposed improved municipal electric lighting system, to cost about $75,000, for which plans have been prepared by Ralph W. Richardson, Zenith Building, St. Paul, engineer.

OWATONNA, MINN.—Bids will be received by the Utilities Commission until Sept. 16 for the construction of a complete underground steam-heating system in the business district. Plans and specifications may be obtained from Arthur L. Mullergren, consulting engineer, Gates Building, Kansas City, Mo.

CLARINDA, IOWA.—The Lee Electric Company, a subsidiary of the Continental Gas & Electric Corporation, is preparing to erect a 33,000-volt transmission line from Clarinda to Villisca, a distance of 16 miles. This will give an additional circuit between the Clarinda power plant and a number of towns served from it.

FORT DODGE, IOWA.—Bids will be received by the City Council until Sept. 9 for the installation of an ornamental lighting system on a number of city streets, including metal standards, fixtures, etc. C. H. Reynolds is engineer.

ROCK FALLS, IOWA.—The installation of an ornamental lighting system in the business district, consisting of fifty-nine lamps, is under consideration.

DONIPHAN, MO.—Plans are being prepared by the Doniphan Light & Ice Company for the construction of an electric light and ice plant. The equipment will include two 60-hp. oil-burning engines, switchboard, distribution system, etc.

MEXICO, MO.—The Public Service Commission has granted the Missouri Power & Light Company authority to erect a 33,000-volt transmission line from Mexico to Moberly.

AURORA, NEB.—The City Council has authorized the city clerk to secure estimates of the cost of a distribution system in the city and also of a complete steam plant and distribution system covering the city.

LINCOLN, NEB. — The Northwestern Service Company, a subsidiary of the Albert Emanuel Company, 61 Broadway, New York City, has applied to the State Railway Commission for permission to issue $1,100,000 in bonds, $150,000 in capital stock and $250,000 in debentures to finance recent purchase of seven power plants in South Dakota and one in Nebraska. It is proposed to erect a transmission line to connect the twelve plants operated in the two states.

PLATTSMOUTH, NEB.—The Continental Gas & Electric Corporation is perfecting plans for the construction of a transmission line from Lincoln to Plattsmouth.

POTTER, NEB.—The Council has voted to acquire the local electric plant of the Farmers' Grain & Milling Company, to be owned and operated by the municipality. Plans are under way for extensions, including adding a new unit.

TOPEKA, KAN.—An ordinance providing for an issue of $36,158 in bonds to pay for the ornamental lighting system has been passed by the City Commissioners.

Southern States

ALBEMARLE, N. C.—The Central Power Company, recently organized with a capital of $100,000, it is reported, plans to erect a transmission line for service in this section. Charles B. Hawley & Company, Munsey Building, Washington, D. C., are engineers.

BRYSON CITY, N. C.—Work has been started on the construction of a municipal hydro-electric plant to develop about 600 hp., on Ocona Lufty River, about 5 miles from Bryson City. A transmission line will be erected to the city. The Berry-Fortune Company, Hickory, is contractor. C. E. Waddell, 78 Patton Avenue, Asheville, is engineer in charge.

DURHAM, N. C.—The Durham Public Service Company has issued $1,500,000 in bonds, part of the fund to be used for extensions and improvements.

SOUTHERN PINES, N. C.—The date for receiving bids for the construction of waterworks and sewage-disposal plant has been extended from Aug. 26 to Sept. 9. The Gilbert C. White Company, Durham, is engineer.

CHARLESTON, S. C.—The City Council has authorized the installation of ornamental lamps on King Street from Broad to Line Street, to cost about $9,000.

MARION, S. C.—The Camp Manufacturing Company is reported to be planning to construct a power house in connection with the proposed rebuilding of its local woodworking plant, recently damaged by fire with loss of about $200,000.

BESSEMER, ALA.—The Alabama Power Company plans to build a substation for lighting service on a site on the North Bessemer Road, recently acquired. The company is negotiating for the purchase of an electric station at Helena, owned and operated by C. T. Davidson, and proposes to extend its transmission lines there.

BIRMINGHAM, ALA. — The Alabama Power Company has been granted permission to erect a transmission line from Greenville to Georgiana and also to build electric distribution systems in Georgiana and Chapman. The company has received authority to take over the plant in Demopolis and to construct and operate an electric system in the town of Silver Hill.

DOTHAN, ALA.—At an election held recently the proposal to issue $750,000 in bonds to provide funds to complete the municipal hydro-electric plant at Chalkers Bluff was carried.

FAIRHOPE, ALA.—The Baldwin County Light & Power Company, recently incorporated, plans to supply electricity to towns along the eastern shore of Mobile Bay, including Battles, Point Clear, Zundels, Fish Village and other rural sections. The power station will be located at Battles. G. R. Wood is president.

BROOKHAVEN, MISS.—Bids will be received by the City of Brookhaven until Sept. 2 for construction of power house, concrete or brick chimney installation of boilers, steam-pipe system, stokers and coal-handling system, etc. Funds to the amount of $50,000 are available for the work. R. S. Purser is city engineer.

LAUREL, MISS.—The voters have approved the new franchise recently granted by the City Council to the Laural Light & Power Company, under the terms of which the company agrees to make extensions to its system, including improvements to power plant, to cost about $60,000; to street-railway system, $20,000, and to distribution system, $20,000.

STARKVILLE, MISS.—The Mississippi Power & Light Company, Jackson, is reported to be negotiating for the purchase of the municipal electric light plant. If taken over, the company plans to extend its high-tension transmission lines to Starkville to furnish service here.

TUPELO, MISS.—The Mississippi Power & Light Company has started work on the erection of a high-tension transmission line from Tupelo to Boonesville, a distance of 30 miles, which will serve electricity to the towns of Boonesville, Baldwin, Saltillo, Gunton and probably other communities. The next link, it is understood, will be a line from Columbus to Tupelo, interconnecting the Columbus and Tupelo power stations.

CLINTON, OKLA.—The Oklahoma Gas & Electric Company, Oklahoma City, which recently acquired the municipal electric plant, plans to increase the output of the plant to 1,250 hp. E. E. Hunter, 626 West Eleventh Street, Oklahoma City, is engineer.

NEWKIRK, OKLA.—Preliminary plans are being prepared for a new water supply, including wells, transmission line, water mains and triplex motor-driven centrifugal pumps in Kelly, etc. F. B. King, Grain Exchange Building, Oklahoma City, is engineer.

ROOSEVELT, OKLA.—A franchise has been granted to Hagemeier Brothers to furnish electricity in Roosevelt. They now operate a small electric plant for their own business, but plan to obtain electricity from the Inland Utilities Company, which is building an electric plant at Hobart to furnish electrical service to the town.

CANYON, TEX.—The Council has plans in progress for the installation of an ornamental lighting system from the proposed station of the Sante Fe Railway to Fourth Avenue, in the business section, about 1¼ miles.

CLARKSVILLE, TEX.—The plant and property of the Clarksville Light Company have been acquired by new interests, headed by C. E. Calder and John W. Carpenter, both of Dallas. Extensions and betterments to the system are under consideration.

HOUSTON, TEX.—The Seaboard Electric Railway Company, Mason Building, recently organized, contemplates the construction of an electric railway from Houston to La Porte via Morgans Point, a distance of about 50 miles. The cost is estimated at $1,000,000. J. A. Cottingham is engineer.

LITTLEFIELD, TEX.—The City Council has granted a franchise to R. E. McCaskill, Electra, to construct and operate an electric plant in Littlefield.

Pacific and Mountain States

HOQUIAM, WASH.—The National Lumber & Planing Mill Company is said to be planning to build a power house in connection with the rebuilding of its local mills, recently destroyed by fire, with loss of about $600,000.

KELSO, WASH.—Plans have been prepared by the City Council for lighting the streets of the city, except in the business district, where it is proposed to install ornamental lamps. The service will be supplied by the Puget Sound Power & Light Company.

TACOMA, WASH.—Plans are under consideration by the Masonic Grand Lodge of Washington for the erection of a home. The first unit will accommodate 250 persons and will include administration building, power plant and water system. The cost is estimated at $400,000. Heath, Gove & Bell, are architects.

GLENDALE, CAL.—The Board of Trustees is arranging for bond issues of $63,429, for the installation of a municipal fire-alarm system, and $36,294, for a police-alarm system.

HEMET, CAL.—Plans are under consideration for the installation of an ornamental lighting system in the business section. C. C. Abbey and F. W. Kennedy are members of a committee in charge.

LONG BEACH, CAL. — The Southern California Edison Company plans to build a substation at 501-3 West State Street.

LOS ANGELES, CAL.—The Board of County Supervisors has authorized the installation of an ornamental lighting system on Covina Boulevard, Main Avenue and Del Monte Street.

LOS ANGELES, CAL.—The City Council has adopted resolutions providing for the installation of ornamental lighting systems on San Pedro Street, consisting of 167 concrete standards; Seventh Street, forty-one pressed steel standards, and on Perlita Avenue, eleven concrete standards.

LOS ANGELES, CAL.—Bids will be received by the Board of Supervisors of County of Los Angeles until Sept. 8 for furnishing and installing the electric light-

ing system, including fixtures and signal systems for six new hospital ward buildings at Olive View Sanatarium near Sylmar. Bids will be received at the same time for furnishing and installing the electric lighting system, including fixtures and signal system for two new children's ward buildings at the above institution. Plans and specifications are on file in the office of the mechanical department, tenth floor, Hall of Records. L. E. Lampton is county clerk.

PALO ALTO, CAL. — Bonds to the amount of $80,000 have been authorized, of which the proceeds of $60,000 will be used for extensions and improvements to the municipal electric system and $20,000 for betterments to the water system.

PIEDMONT, CAL. — The City Council has granted the Pacific Gas & Electric Company permission to erect a substation at Linda and Oakland Avenues.

SAN FRANCISCO, CAL. — The Pacific Gas & Electric Company has acquired a site at Ninety-second Avenue, near East Fourteenth Street, Elmhurst, on which it proposes to build a substation of 10,000 kw. capacity, to cost about $250,000.

SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company has applied to the California Railroad Commission for permission to issue $12,500,000 in bonds at not less than $94.50, the proceeds to be used for extensions and improvements.

TURLOCK, CAL.—The Board of City Trustees has authorized plans for an improved lighting system on all important city streets. Horace Hall is city engineer.

VALLEJO, CAL.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Sept. 9, for one hydro-electric unit, surgical tank and spare parts for the Mare Island navy yard (Schedule 2566).

WHITTIER, CAL. — The City Council has authorized the city clerk to call for bids for the installation of an electric generating unit for the pumping station.

BOISE, IDAHO.—Bids will be received at the office of the Bureau of Reclamation, Denver, Col., until Sept. 29 for furnishing two 6,000-hp. hydraulic turbines, two 5,000-kva. generators, transformers and switching apparatus for the Black Canyon power house, Boise project, Idaho. For particulars address the Bureau of Reclamation, Washington, D. C., Denver, Col., or Boise, Idaho.

PRESCOTT, ARIZ.—The Arizona Power Company is planning to issue about $1,000,000 in capital stock, part of the proceeds to be used for extensions and improvements to its system.

TUCSON, ARIZ.—The Tucson Gas, Electric Light & Power Company has filed plans for an addition to its power station.

Canada

CALGARY, ALTA.—The Calgary Water Power Company has been granted a permit for building an extension to its electric light and power plant, to cost about $10,000.

ATLIN LAKE, B. C.—The Engineers' Gold Mines, Ltd., plans to install additional units at its hydro-electric plant. It is proposed to develop a total of 2,000 hp. for service at the mines.

PRINCE RUPERT, B. C.—The construction of a substation at Cow Bay to replace the present station is under consideration by the municipal Electrical Department.

VANCOUVER, B. C. — The Creo-Dipt Company, Ltd., Tonawanda, N. Y., it is reported, plans to build a power house in connection with its proposed local branch plant for the manufacture of creosoted shingles, for which a site has been purchased. H. B. Kendall is president.

AYLMER, ONT. — The Hydro-Electric Power Commission of Ontario is planning to erect a transmission line from Aylmer to Springfield, to cost about $40,000.

LONDON, ONT. — The Hydro-Electric Power Commission of Ontario has authorized the erection of 8 miles of rural transmission lines in Westminster Township.

SARNIA, ONT.—A bylaw authorizing an appropriation of $40,000 for use of Sarnia Hydro-Electric System has been passed by the City Council.

CAP ROUGE, QUE.—The Quebec Power Company has contracted to furnish electricity (about 15,000 hp.) for the proposed pulp and paper mill to be built at Cap Rouge by the St. Regis Paper Company. A transmission line will be built to the site. The cost of the mill is estimated at $4,000,000. It will be equipped with electrically driven machinery.

Electrical Patents

Announced by U. S. Patent Office

(Issued July 22, 1924)

15,876 (reissue). OVERHEAD ELECTRICAL CONDUCTOR SYSTEM; H. B. Wrenn and A. S. O'Donogue, Cleveland, Ohio. App. filed Nov. 11, 1922. Catenary suspension, using a plurality of contact wires.

15,879 (reissue). SIGNAL; F. T. Vanatta, Mill Valley, Cal. App. filed March 15, 1916. For use at grade crossings of railways and highways.

1,501,908. MOTOR CONTROL FOR SWITCHING MECHANISMS; F. A. Lundquist, Chicago, Ill. App. fild Oct. 2, 1919. For motors used in automatic telephone exchanges.

1,501,909. AUTOMATIC TELEPHONE EXCHANGE; F. A. Lundquist, Chicago, Ill. App. filed Jan. 22, 1920.

1,501,926. LOADED TRANSMISSION CIRCUIT; T. Shaw, Hackensack, N. J. App. filed June 30, 1922. For the transmission of carrier frequencies.

1,501,946. ELECTROPLATING APPARATUS; W. F. Hall, Matawan, N. J. App. filed April 28, 1922. To perform continuously and successively the necessary operations.

1,501,959. LOADED TRANSMISSION CIRCUITS; W. H. Martin, New York, N. Y. App. filed June 30, 1922. For the transmission of carrier frequencies.

1,502,063. ELECTRIC WAVE RECEIVER; W. Schottky, Wurzburg, Germany. App. filed Nov. 6, 1920. For wireless signals.

1,502,065. TURBO-GENERATOR; A. W. Smith, Los Angeles, Cal. App. filed Dec. 24, 1923. Employing a water mist to absorb the heat losses by radiation.

1,502,108. MARINE HAT; J. E. McWilliam, North Oxford, Mass. App. filed March 7, 1923. Metallic; containing an electric lamp which is automatically operated when the hat is put on or taken off.

1,502,139. BRUSH HOLDER; R. W. Elliott, W. A. Johnston and L. J. Buerkle, Dayton, Ohio. App. filed July 13, 1921. In which certain portions of the contacting surface of the brush engage with the commutator at different speeds.

1,502,140. WELDING APPARATUS; T. M. Hunter, Newark, N. J. App. filed March 24, 1922. With which a plurality of welding or other heating operations are simultaneously carried out with a single machine.

1,502,168. AUTOMATIC TELEPHONE SYSTEM; J. Wicks, Chicago, Ill. App. filed May 31, 1919.

1,502,169. ELECTRIC TOOL; C. B. Bennett, Louisville, Ky. App. filed Nov. 5, 1921. With a handle, applicable to drill, etc., shaped and arranged to facilitate manipulation of the tool and for conveniently actuating the electric switch.

1,502,188. PROCESS FOR SOFTENING WATER; F. E. Hartman and H. B. Hartman, Scottdale, Pa. App. filed March 21, 1922. Chemical reaction assisted by electrolysis.

1,502,195. COIL SUPPORT; C. T. Hibbard, Minneapolis, Minn. App. filed Oct. 2, 1922. For use in the construction of revolving field poles.

1,502,213. ELECTROLYTIC PROCESS FOR THE PRODUCTION OF SULPHIDES; R. Rodrian, New York, N. Y. App. field April 26, 1922.

1,502,249. ELECTRIC STEAM RADIATOR; A. C. Hulbert, San Carlos, Cal. App. filed Sept. 8, 1921. Automatic.

1,502,294. METHOD OF REGULATION OF HEAT GENERATED BY ELECTRICITY; L. G. de Kermor, Edmonton, Alberta, Canada. App. filed Dec. 2 1921. Where the heat derived is proportionate to the area of the immersed surface of the electrode or electrodes.

1,502,295. SELF-REGULATING WATER HEATER; L. G. de Kermor, Edmonton, Alberta, Canada. App. filed Dec. 2, 1921.

1,302,304. ART STAND LAMP; J. T. Gaines, Indianapolis, Ind. App. filed June 12 1922.

1,502,315. ELECTRICAL HEATING UTENSIL. F. J. Möller, Copenhagen, Denmark. App. filed March 20, 1922. Hot plate with element arranged in spirals on an insulating element.

1,502,330. ELECTROSCOPIC APPARATUS FOR TESTING THE GENUINENESS OF W[illegible]N AND LIKE MATERIALS; A. Bernini, Genoa, Italy. App. filed Sept. 20, 1922.

1,502,338. PORTABLE ELECTRIC LAMP; J. Holl and G. E. Boetteher, Richardson, N. D. App. filed Aug. 14, 1922. Using a spring motor to operate a generator for producing the necessary current.

1,502,341. HEATING SYSTEM; E. G. Loomis, Newark, N. J. App. filed Feb. 28, 1922. For heating materials at a comparatively high temperature and particularly applicable for heating camphor stills.

1,502,343. PROCESS AND APPARATUS FOR MAKING ELECTRICAL CONDENSERS; B. MacPherson, Roxbury, Mass. App. filed May 26, 1920. Of the sheet type where mica is used for the dielectric sheets.

1,502,361. MOTOR STARTER; H. L. Van Valkenburg and F. W. Magin, Milwaukee, Wis. App. filed Jan. 5, 1920. Automatic compensator, including a starting switch that energizes the operating coils of the switch.

1,502,370. TRAFFIC MOVEMENT INDICATOR FOR VEHICLES; E. E. Bullard, Fresno, Cal. App. filed Feb. 7, 1922.

1,502,373, 1,502,374. ELECTRIC REGULATION; J. L. Creveling, White Plains, N. Y. App. filed Nov. 1, 1916. Applicable to systems employing a generator to charge a storage battery and operate lamps or other devices in conjunction therewith.

1,502,442. BUS STRUCTURE; A. M. Rossman and J. C. Sanderson, Chicago, Ill. App. filed May 12, 1920. Made up of a number of identical units which are assembled into a complete structure.

1,502,455. STORAGE BATTERY; W. H. Wood, South Euclid, Ohio. App. filed July 1, 1921. Lead-oxide cell.

1,502,460. RADIO SIGNALING APPARATUS; G. H. Clark, Brooklyn, N. Y. App. filed April 26, 1921. Using a quenched spark gap.

1,502,461. LIGHTING FIXTURE RING; A. Cooper, Brooklyn, N. Y. App. filed Feb. 24, 1923. With the ring member made up of a number of parts.

1,502,489. APPARATUS FOR AUTOMATIC ARC WELDING; C. Steenstrup. Schenectady, N. Y. App. filed Jan. 2, 1920.

1,502,493, 1,502,494. TIME-INDICATING APPARATUS; H. E. Warren, Ashland, Mass. App. filed April 15, 1918. Using standard clockwork and a synchronous motor.

1,502,527. ROTARY FIELD MAGNET; W. Reichel, Berlin-Lankwitz, and W. Gscheidlen, Berlin-Schmargendorf, Germany. App. field Nov. 6, 1920. Constructed to withstand heavy centrifugal forces.

1,502,550. ELECTRICAL CONNECTION; G. L. Chamberlain, Chicago, Ill. App. filed Aug. 14, 1922. For the ready removal of an appliance, as a transformer, from a circuit.

1,502,562. THERMOPILE AND METHOD OF ITS MANUFACTURE; H. Hausrath, Durlach, near Karlsruhe, Germany. App. filed Aug. 15, 1922.

1,502,588. ELECTRIC ENAMELING TOOL; W. G. Probst, Louisville, Ky. App. filed Jan. 28, 1922.

1,502,596. TROLLEY; M. D. Stalder, Lincoln Neb. App. filed Sept. 14, 1923. Contract shoe of the grooved roller type.

(Issued July 29, 1924)

15,880 (reissue). OZONE GENERATOR; H. B. Hartman, Scottdale, Pa. App. filed Oct. 11, 1921.

1,502,665. SWITCH; D. D. Gordon, Chicago, Ill. App. filed Sept. 10, 1919. Pull-chain type for use in lamp sockets.

1,502,674. IGNITION SYSTEM; J. H. Hunt, Dayton, Ohio. App. filed Nov. 18, 1920. For internal-combustion engines.

1,502,682. IGNITION DEVICE; J. H. Reed, Maumee, Ohio. App. filed Nov. 3, 1921. For incorporation as an ignition intensifier for jump sparks, as in internal-combustion motors.

1,502,708. ELECTRODE; W. G. Allan, Toronto, Canada. App. filed Feb. 3, 1920. For use in electrolytic apparatus adapted for production of hydrogen and oxygen from water.

1,502,730. MEANS FOR LUBRICATING AND COOLING A SUBMERGED AND INSULATED ELECTRIC MOTOR; R. Longue, Pantin, France. App. filed March 7, 1921.

1,502,767. POWER TRANSMITTER; W. Davis, Chicago, Ill. App. filed Nov. 15, 1922. For use in connection with a brake mechanism for automobiles utilizing an electric motor.

1,502,789. ARC WELDING; J. C. Lincoln, Cleveland, Ohio. App. filed May 22, 1922. Employing copper instead of steel for the purpose of welding cast iron or other ferrous metal by the use of an electric arc.

1,502,811-1,502,817. HIGH-FREQUENCY MULTIPLEX SIGNALING SYSTEM; L. Espenschied, Hollis, N. Y. App. filed Sept. 30, 1919. Terminal circuit arrangement embodying a common translating circuit adapted both to modulate the transmitted current and to demodulate the high-frequency received current.

1,502,819. ELECTRIC HEATER; G. N. Frolick, Buffalo, N. Y. App. filed Sept. 29, 1922. Radiant-resistance type for fireplace use.